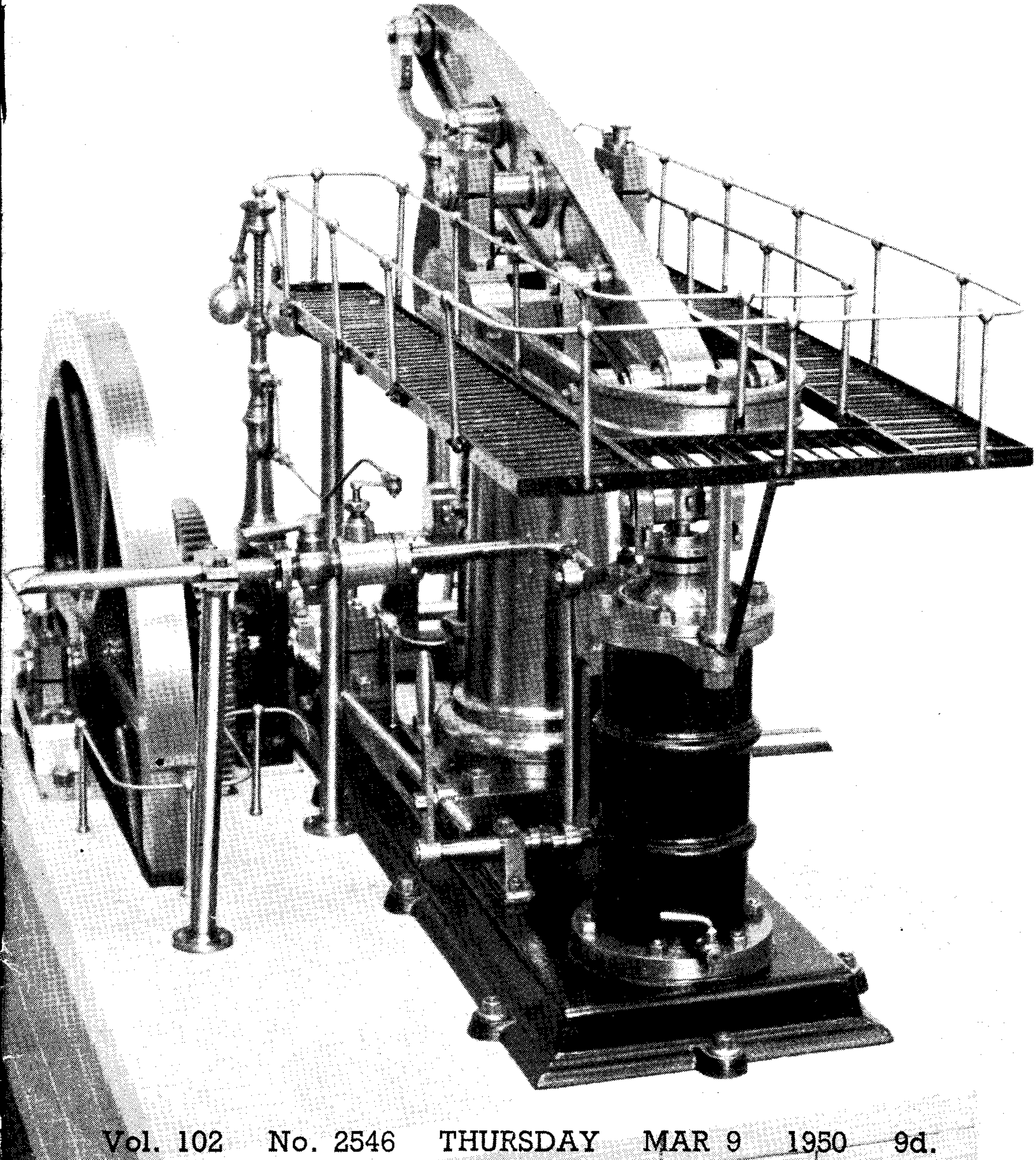
THE MODEL ENGINEER



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The MODEL ENGINEER

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SMOKE RINGS

Come On, You Chaps !

● ARISING OUT of our recent announcement of pending developments in THE MODEL ENGINEER when we included a reference to " certain instances of applied science in the home," we have received a short article from a lady who writes under the pseudonym " Workshop Widow." We are publishing the article in this issue, and would commend it to the special attention of our readers.

We admire the manner in which our lady friend presents her case ; no recriminations, but just a simple human appeal that can scarcely fail to suggest ideas to the mere man who enjoys his workshop, often to the exclusion of anything else to which he might apply off-time spent at home.

So, take heed, you erring males ! Read what " Workshop Widow " has written so charmingly and then see that you do *something* about it. After you have done that, remember the intentions of THE MODEL ENGINEER, and send us an illustrated description of what you have made. Some of you have probably already contributed something to the comfort and amenities of your homes, and so won over the sympathy and regard of the other members of your household who, thenceforth, became far less inclined to look askance at your hobby. If this is the case, then we want to know about it and to publish your stories ; they may give ideas to other readers. It will be to your advantage, in more ways than one !

A Bright Idea

● WE NOTE that the East Grinstead and District Model and Experimental Engineering Society now sets aside half an hour of each meeting for the purpose of hearing and discussing hints and tips from members. This is done primarily for the benefit of novices to our hobby, and we think it is a bright idea.

Incidentally, we would take this opportunity of admonishing a mild rebuke to certain people who seem to think that *all* novices are young boys. The word " novice," whenever it appears in our pages, is used in its true sense, and denotes a person who, for any reason whatever, is a newcomer to model engineering, no matter what his age may be.

For this reason, the information which we publish for the benefit of novices does not always pre-suppose a complete lack of knowledge of the use of workshop equipment. On the other hand,

many novices are young people who are keen to take up model engineering, but have had no training in workshop processes and often possess little or no equipment ; such people, also, must be catered for and given the best possible advice. " It cuts *both* ways ! "

The Northern Models Exhibition

● WE LEARN that at the closing date, February 15th, notification had been received of a very satisfactory number of exhibits. In the competition section, particularly, some really outstanding entries will be on view. These will be judged by a large panel of judges which will include : Mr. R. O. Harper, Chairman of the Northern Association of Model Engineers, Eng. Lt.-Cdr. B. J. Presland (ret.), Messrs. H. Rochester, W. P. Wadsworth, F. J. Camm, B. Gilbey, J. N. Maskelyne, C. S. Rushbrooke, L. H. Sparey and E. T. Westbury.

The junior exhibits, up to the closing date for entries, were much fewer than had been hoped ; therefore, the organisers have announced that they are prepared to accept entries up to the middle of March. So, if any prospective junior competitor thinks that he is too late, he should note this change of date, complete his entry-form and return it at once to Mr. W. P. Wadsworth, 16, Leslie Avenue, Whitefield, nr. Manchester, and then, of course, see that his model is finished in time.

A Tunnel Nuisance

● IT IS now fairly common knowledge that railway access to Hastings from the west has been non-existent for some months, owing to the enforced closure of the Bo-Peep (St. Leonards) Tunnel. The 100-year-old brickwork in the tunnel had been giving trouble for some time, and in spite of all efforts to prevent it, the trouble at length became so severe that really systematic and extensive repair work had to be undertaken.

Restoration work is proceeding in this ¾-mile long tunnel which had to be closed entirely from November 26th last, on account of cracking, subsidences and partial flooding. Meanwhile Hastings and the principal St. Leonards station of Warrior Square are cut off by rail from the London and Brighton directions. These conditions may continue for two months or more yet. Observations show that the flooding has been stopped and the subsidence greatly checked. Many concrete inverts have been placed in position. The worst trouble is towards the western mouth ; in order to provide the greatest security here a steel or cast-iron lining is being installed to replace defective brickwork but this will be a costly process taking some time though it is estimated to be quicker and more effective than a rebricking process. Messrs. John Mowlem have charge of much of the repair work. Some steam relief trains were run to and from Hastings via Ashford (Kent) at Christmas, adding 20 miles to the normal direct route through Tunbridge Wells, for the working of which " Schools " class engines were permitted between Ashford and Hastings, via Rye, subject to certain speed restrictions. Some such workings may be repeated at Easter.

Trains run normally between Hastings and Ashford, serving the East Kent area, but as the westward line is blocked persons and packages start off by special bus from Hastings or Warrior Square either to West Marina, or West St. Leonards, stations which are contiguous, whence rail services are available. From February 27th, push-and-pull trains have operated locally between West St. Leonards and Crowhurst, connecting with each service on the London (steam) line, passengers changing at Crowhurst. The longer bus journeys over an unsuitable country road—Crowhurst-St. Leonards-Hastings—which had operated since December 5th, were then discontinued. During the continuance of the emergency, therefore, the normal procedure south of Crowhurst is reversed since the main line trains use the Bexhill West branch for terminal purposes while the " branch locals " run to West St. Leonards where, as at West Marina on the electrified route, additional signals, points, etc., have been provided.

Chichester Does it Again

● THE SECOND exhibition to be organised by the Chichester and District Society of Model Engineers was opened on Monday, February 20th, at the historic Assembly Rooms, North Street, Chichester, by the Rt. Hon. Lord Brabazon of Tara, P.C., M.C., who made a most entertaining and appropriate speech. He stressed the importance of model engineering as a hobby, pointed out the value of craftsmanship and appealed to the citizens of Chichester to support the exhibition and other activities of the society in their midst.

The proceeds of the exhibition will be added to the society's Model Sports Centre and Workshop Fund. Already, the Corporation has granted the lease of a one-acre site to the south of the city and has shown great interest in the plans which the society has prepared for the laying out of the ground. During the coming season, the members will busy themselves with the necessary clearing, levelling and fencing of the site and begin the erection of the spacious workshop.

The exhibition was most attractive and considerably more varied than the highly successful one held last year. The competition section, comprising some ninety exhibits, was judged by Messrs. E. T. Westbury and J. N. Maskelyne, who were thoroughly pleased with the high standard of workmanship displayed.

Britain's New Turbine Locomotive on Trial

● BRITAIN'S FIRST gas-turbine locomotive, which has been designed and built by the Swiss Locomotive Works, arrived at Swindon on February 15th. It came from Switzerland *via* Harwich, whence it was towed to Swindon. It has since undergone preliminary trials for the purpose of familiarising some drivers with its controls. Within the next few weeks, we understand, it will begin a series of tests with a view to observing its performance in traffic. It has already proved itself simple to control, and hopes are high that it will achieve the results expected of it.

A Reader's "M.E." Beam Engine

Winner of Bronze Medal in the 1949 "M.E." Exhibition

by R. A. Barker

HAVING obtained Volume 30 of THE MODEL ENGINEER (January to June, 1914) I was greatly impressed by the design of the $1\frac{1}{2}$-in. scale beam engine described by Mr. George Gentry, which appeared to be a very robust design and a good example of the engineering practice of the 19th century. Another thing that impressed me, and was really the cause of my determination to make the model, was the fine and complete detail shown in the drawings, which appeared to me to be the finest I have ever seen in THE MODEL ENGINEER.

As the lathe available for the construction of the model was the well-known 4-in. Drummond, the size of the model had to be reduced to three-quarters of that described, in order to machine the various parts with ease. The patterns were first made and castings obtained from a firm, whose main business was making fireplaces. Despite the thin section of the castings, they were found to be of very good quality, quite free from hard places, and were a pleasure to machine.

The bedplate was first marked-off and milled in the lathe. The next item was the cylinder, which was bolted to the cross-slide and bored with a boring bar between centres. The column, which is a hollow casting, was turned, and the square base, the fluting and the ovalo moulding were all milled. Beam pedestals built up of steel were fitted to the column top. The beam is fabricated of mild-steel and consists of one $\frac{1}{8}$ in. centre-plate, to either side of which are riveted $\frac{1}{16}$ in. thick plates having tapered slots milled in them. A piece of $\frac{1}{2}$ in. $\times$ $\frac{1}{16}$ in. strip was then wrapped round the outside of the beam to form the beading, and secured by $\frac{1}{16}$ in. countersunk screws made from $\frac{1}{8}$ in. round steel screwed in tightly, then cut off and finished flush. The joints of the beading are underneath the beam and cannot normally be seen.

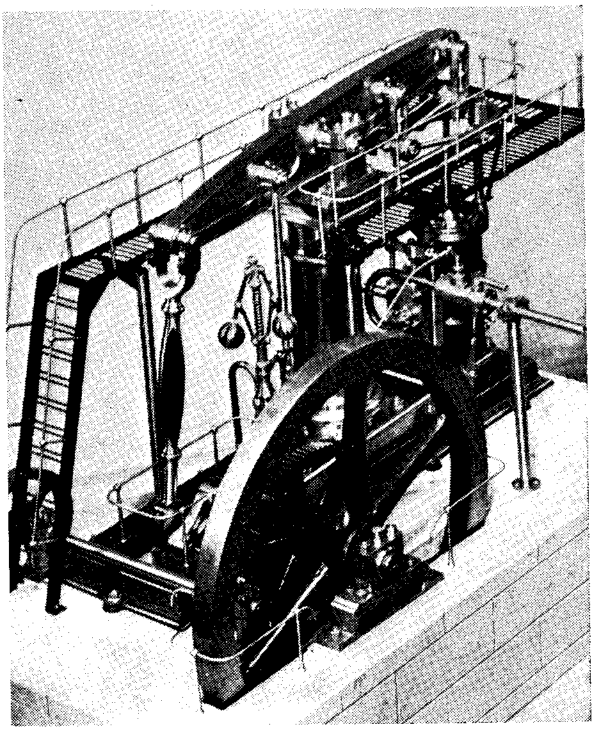
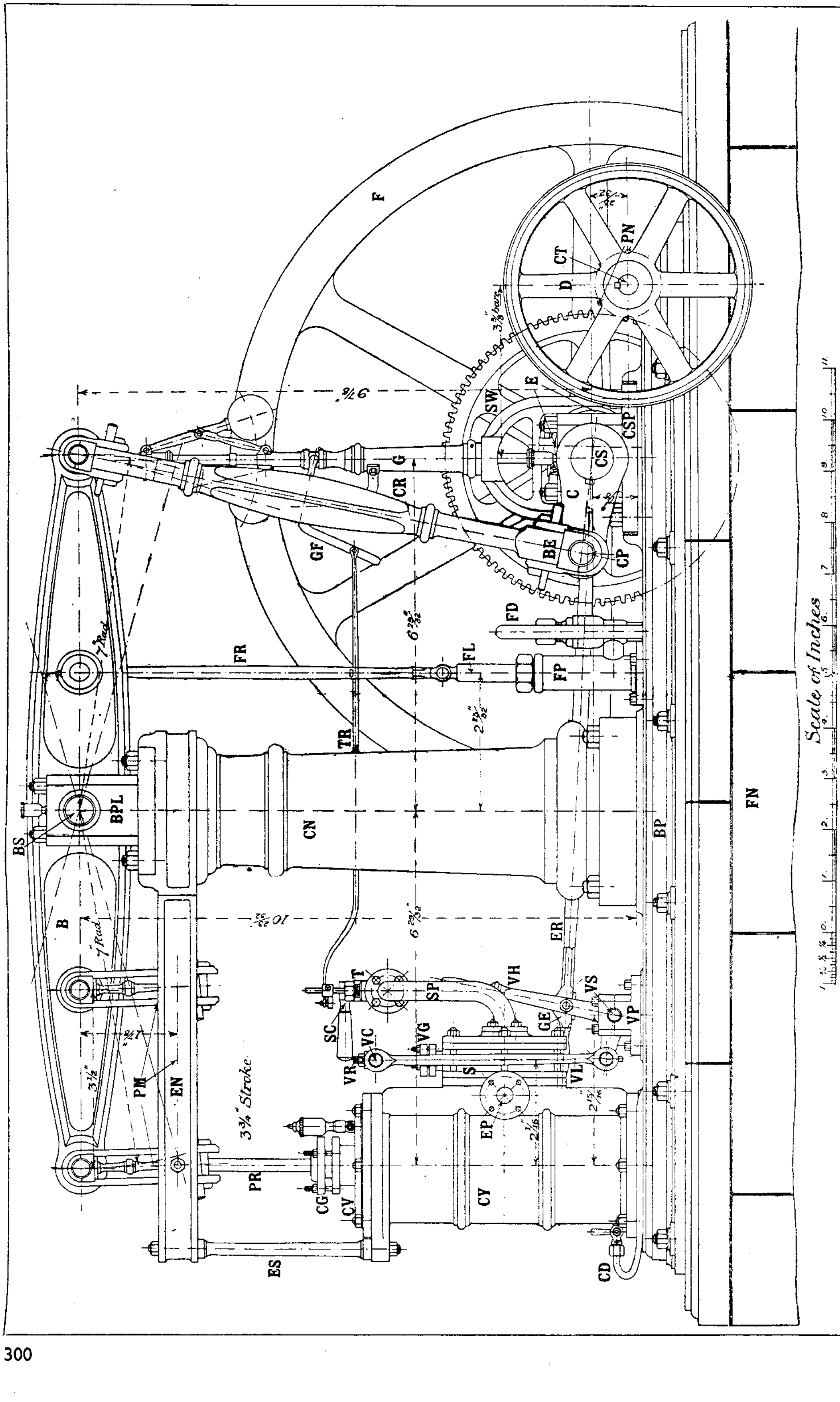
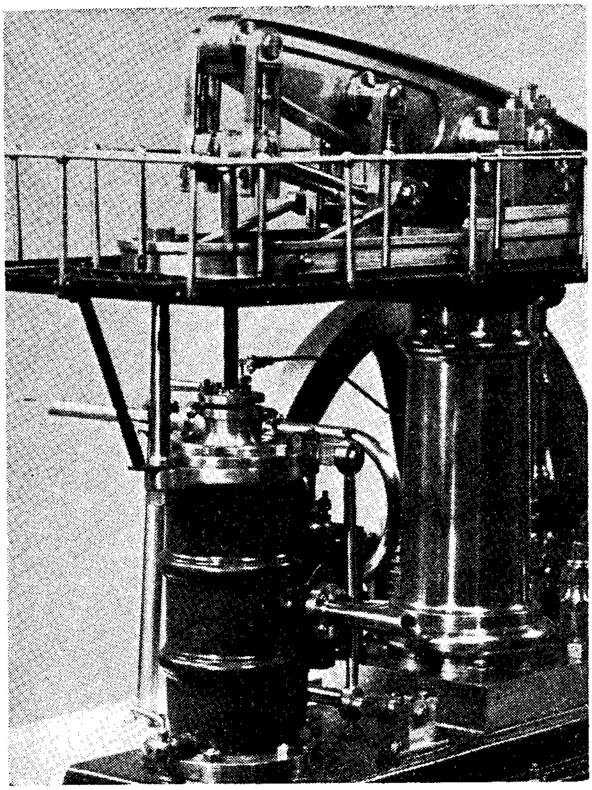


Photo by] [*Coronet Studios*

To make the connecting-rod, a piece of $1\frac{1}{4}$-in. B.M.S. was first turned roughly to shape, then the barrelled portion in the centre was turned by removing the cross-slide screw and fastening a strip of steel to a fixture behind the cross-slide. The distance from the attachment pivot to the tool was arranged to be equal to the radius of the barrelled portion, so that on working the saddle, the tool was traversed in an arc. To machine the cruciform section of the rod, it was attached to a piece of $1\frac{1}{2}$ in. $\times$ $1\frac{1}{2}$ in. angle-iron on the cross-slide, the apex of the angle being set vertically, and the connecting-rod bolted to the saddle nearest the chuck, so as to present it at an angle of 45 deg. to the plane of the squared ends. A cutter was made out of an old shipyard punch, and this was used to mill the first flute, after which the rod was turned through 90 deg. and another flute cut, and so on. The cotter ways in the top and bottom ends were cut by a piercing saw, a hole being first drilled through the rod, and the saw threaded through the hole and fastened into the saw frame. After cutting one end of the slot, the saw was reversed to square out the remaining parts of the drilled hole. Incidentally, these saws used to be sold five on a card for 2s. 6d. before the war; they varied in width from 1/32 in. to $\frac{1}{8}$ in., but



Side elevation of model non-condensing beam engine



leaving the full thickness at each end, then slitting the plate into four pieces $\frac{3}{16}$ in. wide, the width of the link. The strips were then bent round a piece of $\frac{3}{8}$-in. mild-steel. Again the cotter-ways were cut by the piercing saw.

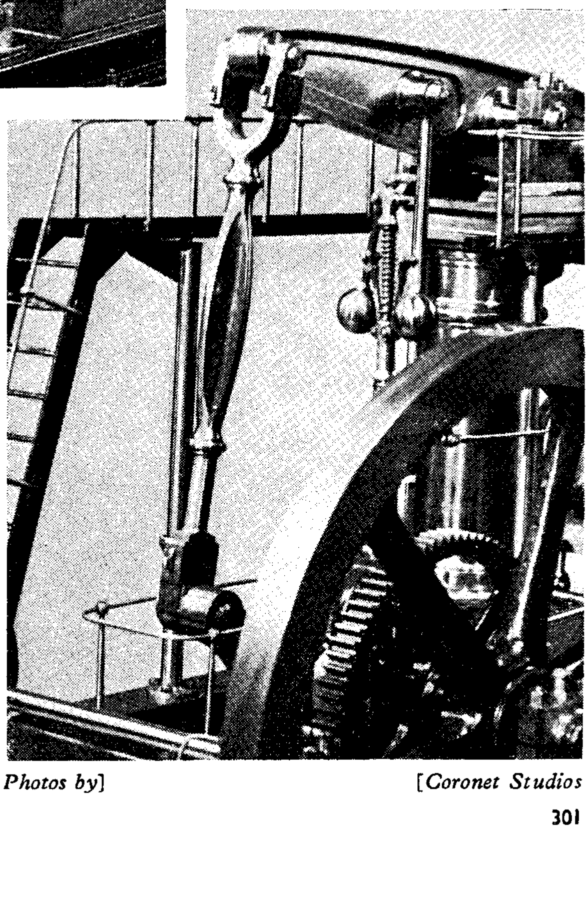
Both the bevel wheels for the governor, and the spur wheel and pinion for the countershaft, were cut in the lathe, using home-made cutters, and were quite an interesting job to do. The eccentric-rod and pump-rod are both barrelled as in the case of the connecting-rod, and were machined in the same way. A somewhat tricky portion was the machining of the tapered eccentric-rod, which is approximately 8 in. long and 7/32 in. diameter, but this was turned successfully without using a steady on the 4 in. Drummond lathe.

Gratings and hand-rails were put on as an afterthought, and have caused quite a lot of discussion as to whether or not they were correct on this type of engine, but before doing so it was noticed that *The Engineer* of February, 1874, describes a similar engine owned by the G.P.O. which has iron ladders and gratings. It may be interesting to mention that the gratings were made out of pawn-broker's pins sweated in the

I have not been able to obtain them since the war, I believe they were Swiss made.

The entablature, which, by the way, was a casting, was quite an interesting part to machine. The fluting was done by fastening the casting on to a circular table, the centre of the radius of the entablature being on the centre of the circular table, which in turn was fastened to the vertical slide, so that the face of the table was vertical. Here again, a special cutter was made out of the same punch, and the casting was marked to show where the radius portion began and ended. The straight fluting was cut by operating the cross-slide, and when the mark indicating the beginning of the curvature was reached, the circular portion was then cut by operating the circulating table, until the other mark was reached, when the remaining straight fluting was cut by operating the cross-slide in the reverse direction. In brief, the complete fluting was done by one continuous milling cut; the thickness of the entablature at the bottom of the flute is only 3/32 in.

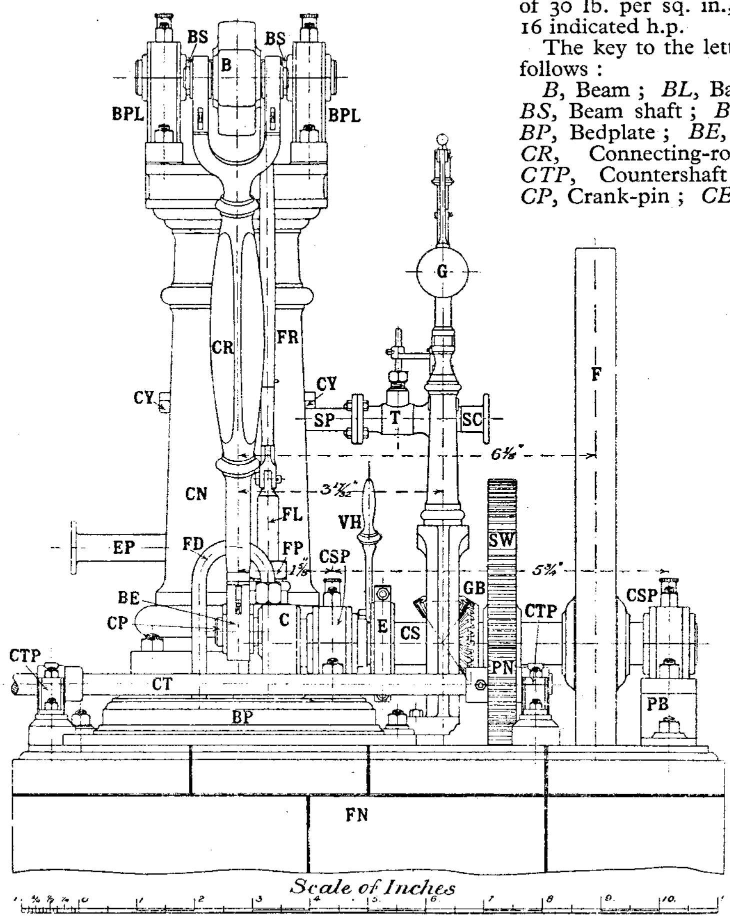
The parallel motion links were made in the following way. A piece of $\frac{1}{4}$-in. plate was milled down to $\frac{1}{16}$ in. thick,



Photos by] [*Coronet Studios*

side bars. The engine has had about 200 hours' running at various exhibitions and it is quite fascinating to watch, particularly the operation of the parallel motion when running at about 60 r.p.m.

I would like to congratulate Mr. George Gentry on the excellence of his drawings. A really accurate set of drawings is half the battle when one attempts to make an authentic old-time model.



Editorial Note

At the request of many of our readers, we are reproducing herewith the original general arrangement drawings of the "M.E." beam engine as taken from the issue of THE MODEL ENGINEER of January 1st, 1914. The design was drawn by Mr. George Gentry from an actual model, the history and precise origin of which were unknown, but the model bore the name of Oakley, Bermondsey, who was stated to be the maker, and from other available information, it was gathered that he was at one time in business as an engineer and millwright in the district referred to.

It is generally regarded as a good representative model of the type of beam engine used for small and moderate powers in driving factory machinery. Although the scale of the actual model could only be surmised, careful consideration indicated it to be a scale of 1½ in. to the ft. and these dimensions were adhered to in the detail drawing. The full-sized engine, under these circumstances, would occupy an area of 17 in. × 8 ft. 2 in. with a flywheel 9 ft. 3 in. diameter, and bore and stroke of the cylinder 15 in. × 2 ft. 6 in. Running at a speed of 20 r.p.m. and working with a mean effective pressure of 30 lb. per sq. in., the engine would develop 16 indicated h.p.

The key to the lettering on the drawings is as follows :

B, Beam ; *BL*, Back links (parallel motion) ; *BS*, Beam shaft ; *BPL*, Beam shaft pedestals ; *BP*, Bedplate ; *BE*, Big-end ; *CN*, Columns ; *CR*, Connecting-rod ; *CT*, Countershaft ; *CTP*, Countershaft pedestals ; *C*, Crank ; *CP*, Crank-pin ; *CE*, Crank race ; *CS*, Crankshaft ; *CSP*, Crankshaft pedestals ; *CH*, Crosshead; *CY*, Cylinder; *CV*, Cylinder cover; *CD*, Cylinder drain and cock ; *CG*, Cylinder gland ; *D* Driving pulley ; *E*, Eccentric ; *ER*, Eccentric-rod ; *EN*, Entablature ; *ES*, Entablature stay or column ; *EP*, Exhaust pipe ; *FP*, Feed pump ; *FD*, Feed pump delivery ; *FL*, Feed pump plunger ; *FR*, Feed pump-rod ; *F*, Flywheel ; *FE*, Flywheel race ; *FN*, Foundation ; *GE*, Gab-end ; *G*, Governor ; *GB*, Governor bevel gear ; *GF*, Governor fork lever ; *PM*, Parallel motion ; *PL* Parallel motion links ; *PD*, Parallel-rods (parallel motion) ; *PB*, Pedestal bracket ; *PN*, Pinion ; *PR*, Piston-rod ; *R*, Radius-rods (parallel motion) ; *SW*, Spur wheel ; *SR*, Spur Wheel race ; *S*, Steam chest ; *SC*, Steam cock ; *SP*, Steam pipe ; *T*, Throttle valve ; *TR*, Throttle valve-rod ; *VG*, Valve gland ; *VH*, Valve hand lever ; *VL*, Valve motion links; *VS*, Valve motion shaft; *VR*, Valve-rod ; *VC*, Valve-rod crosshead ; *VP*, Valve shaft pedestals.

Tramway and Light Railway Models

An attempt is being made to draw up a set of standard dimensions and scales for these models to help interchangability of parts and of models.

Will modellers of light railways, tramways and overhead conductors for electric railways of 1-in. scale downwards send particulars of the scale, gauge, wheel, track and conductor dimensions and clearances used to Mr. R. Meadowcroft, "Calderglen," Colne, Lancs., who will collate the data.

Model Widows

by " Workshop Widow"

EVERY man should have a hobby.

This is a cliché among modern wives, and like most clichés, accepted as true without analysis.

Every weekend millions of women watch the man of the house trying not to break into a gallop as he disappears clutching a fishing rod, golf clubs or even a football match ticket.

Of course, some hobbies keep the men at home, and perhaps the most popular of them is model engineering.

The every increasing ranks of enthusiasts play happily in the tool shed, kitchen or any corner that they can rope off from anxious wives and fiendishly inquisitive children.

No doubt they tell each other that the little woman is happy and fortunate to have them at home all the time. Of course she is, unless the enthusiast becomes a fanatic (not so unusual in engineering) and the wife has to rope off a small corner of the house for herself and the children.

What men seldom realise is that intelligent wives, although wise enough to understand that a man must find some outlet for the inventive genius and energy inherent in him, instinctively resent anything that removes their spouse completely from them and their interests.

And model engineering seems at first to be far removed from the average female's enthusiasm.

With tolerance on one side and moderation on the other, life can go on quite tranquilly in the modeller's home without undue breakage of crockery.

But suppose our model engineer becomes enthralled by his little project to the exclusion of everything?

That bang-bang and merry whistle from the wood shed doesn't do a thing for Mrs. M.E. as she feverishly beats a sponge mixture, or the waste pipe gurgles half-heartedly with the first inch of washing-up water and refuses the rest with a greasy hiccough!

Then perhaps Mrs. Smith calls for a chat and says that, really, Mr. Smith is wonderful. He insisted upon bringing her to the door and is calling for her at ten o'clock. They haven't missed supper together for fifteen ye rs.

Just as Mrs. Model Engineer is saying, " Yes, Joe is just like that, too," a voice from the kitchen calls: "For goodness sake, don't make anything for me. I'll have my cocoa in here as usual."

All this is calculated to give the lie to that " Mon Repos " painted on the gate.

The solution is one of those simple little things that Solomon used to let off before breakfast.

If Mr. Model Engineer would occasionally use his skill and imagination to make some gadget or mechanical aid for the home, Mrs. Model Engineer might even get to smile at the whistle behind the wood shed door.

There are so many possibilities in the average home for creative genius that the problem must be where, not how to start.

Something simple to clear that gurgling sink—an electric beater for the sponge mixture—that clever hedge trimmer from the January 19th issue of THE MODEL ENGINEER? This last is particularly appropriate with spring on the way and every wife planning her gardening to allow for time off in a deck chair.

The charm of the plan is that the model engineer gets just as much fun and satisfaction from his achievement in the domestic field, while his wife does not regret the time or slight chaos involved, because the result is for her.

She might become interested in the creation of something that is going to play a part in her everyday life, and continue in that interest when her husband turns again to the more unusual trains, planes and motors of model engineering. Once the model engineer has tried his skill at home gadgets, however, I imagine that their fascination will never completely leave him.

Then there is the obvious reward—the pleasure and new understanding of his wife. The next time Mrs. Smith came to call she could say, " No, my husband isn't having supper with us. He's in the kitchen making me a refrigerator. Really, I don't know what I'd do without him ! "

Mr. Smith would probably get a year's subscription to THE MODEL ENGINEER, on his next birthday.

For me, personally, the most important side of this venture would be that the subconscious resentment I mentioned at the beginning of this article—the feeling that the hobby, though desirable, was removing a man from his wife—would be gone.

So she would be gay and co-operative ever more, and our Mr. Model Engineer would cry, upon meeting his friend, " Now I've got a model wife."

To which the startled friend might reply, " Good Heavens, what will you make next ! "

For the Bookshelf

Newnes Short-Wave Manual (Seventh Edition) by F. J. Camm. (London: George Newnes Ltd., Southampton Street, London, W.C.2.) Price 6s.

In the latest edition of this popular work, the chapters have been rearranged in a suitable sequence to enable the student to work progressively from simple elements to practical details of short-wave receivers and their design. A number of useful tables applicable to the design and operation of short-wave receivers are given at the end of the book.

PETROL ENGINE TOPICS

More about Unusual Engines

by Edgar T. Westbury

IN the issue of THE MODEL ENGINEER dated September 1st last, I gave a description of a very curious old gas engine which had been unearthed by one of our readers, and which embodied some unusual features of design, including a revolving piston, which also served the purpose of a sleeve valve. The origin and maker's name of this engine were unknown at the time, and the assistance of readers in obtaining further information on these points was requested. As a result, quite a number of readers came forward either with hints and suggestions as to the possible origin of the engine, or with first-hand experiences with it. Some of the letters on the subject were published in the "Practical Letters" column, and it seems to be definitely established that the engine was known as the Dawson engine, and was produced in various forms, for a variety of purposes, before the beginning of the present century. A rather perplexing fact, however, was that a few readers were equally positive that it was known as the Paris Singer engine, and in one case I was invited to inspect an engine differing in very minor detail to the one I illustrated in THE MODEL ENGINEER, but obviously of the same design. The owner, Mr. Gyatt, of West Croydon, who remembered the purchase of the engine some half a century ago, was quite sure that it bore the latter name.

This discrepancy was cleared up in due course, as will appear later, but to take events in their proper order, another reader was able to refer me to an article published in the issue of the *Motor* dated October 28th, 1942, in which the author, Mr. L. Graham Davies, described the Dawson engine, together with other curiosities of automobile history, though none of the latter appear to have been developed in a practical way to the same extent as the engine in question. By courtesy of the editor of the *Motor*, I am able to reproduce the sectional drawing of the engine (which, except for being air-cooled, is substantially identical with the one I described in THE MODEL ENGINEER) and also to quote from the section of the article which describes it, as follows :—

" . . . . the Dawson engine, produced and sold in France. Automatic inlet valves in early petrol motors often gave trouble, and the inventor decided to do away with valves altogether whilst retaining the four-stroke cycle. His engine had a revolving piston which opened and closed the inlet and exhaust ports. The connecting rod had two members, rather like the ulnar and radius bones in the human forearm, one member being tubular. Rotary movement was imparted to the piston by skew gearing, one pinion being cut in the crank face, whilst the other was mounted on the end of a shaft carried inside the tubular member of the connecting rod. An upward extension from the piston head controlled the opening and closing of the ports. The Dawson engine, which was made in air-cooled and water-cooled forms, had some success, but excessive wear, due to the spiral movement of the piston, probably caused its abandonment."

The next item of information received was from Mr. W. H. Skinner of Ottery St. Mary, Devon, and this, coming "right from the stable" as it were, appears to clinch the whole argument. He writes : " . . . I can give you the information you seek as to the origin of these machines. They were the invention of a Mr. Dawson, and were manufactured by the Paris Singer Syndicate, in a small factory at Manor St., Clapham, London, S.W. This factory had originally been a private residence (probably the old Manor) situated in what had at one time been a spacious garden.

"The bore of the standard engines was somewhere about 4 in., but the one described in your columns ($2\frac{1}{2}$ in. bore) must, I feel, be the one made and fitted to an old cushion-tyred bicycle with which experiments were carried out in the grounds (using various liquid fuels) and was one of the first (if not *the* first) attempts at motor cycling.

"As far as I remember, the standard-sized engines, using town gas, ran the workshop machinery, together with dynamos for shop lighting, quite satisfactorily, but the small engine, using liquid fuel, and attached to the cycle, seemed to transform the latter into a most vicious mechanical bucking broncho !

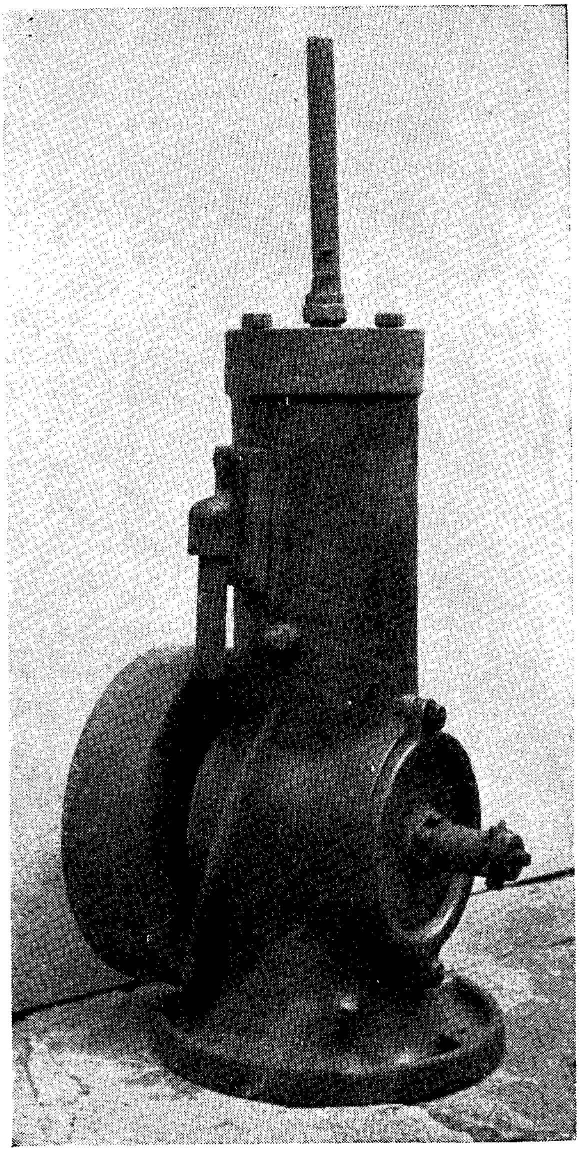
"The factory producing these engines had but a brief existence—a year or two at most—and finally closed down about the end of 1895, when I, who had been employed there as tool-maker, took to the sea for a living, and I have never revisited the old spot. As I was then the youngest mechanic of the happy crowd who worked in 'the shop in the garden,' it may be that I am now the sole survivor."

Many thanks to Mr. Skinner for the first-hand information, which not only sheds a good deal of light on the matter, but also constitutes an interesting reminiscence of factory life in the pioneer days of the i.c. engine. It will be seen that this account appears to be at variance with the statement by Mr. Davies that the engines were produced in France, but it is possible that some misconception may have been caused by the name of the manufacturers, or, alternatively, they may have had another factory in France. The reason suggested by Mr. Davies for the failure of the engine does not seem entirely convincing, as the piston wear is not necessarily accentuated by the elliptical (not *spiral*) motion ; it is more likely that the engine was many years

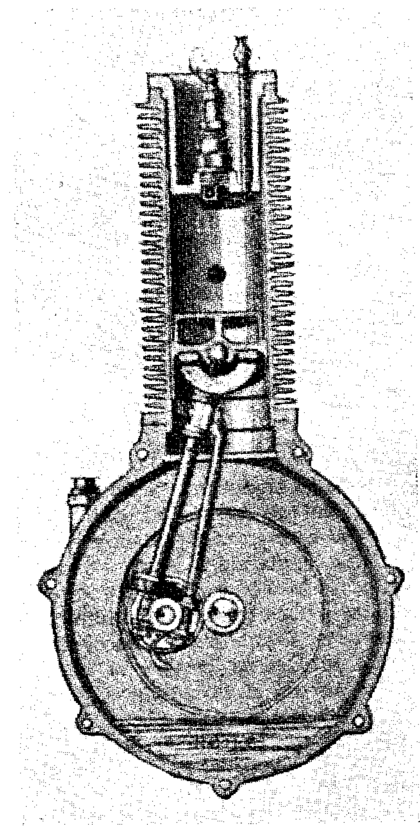
ahead of the mechanical and metallurgical resources of its time, and as I have already suggested, an engine built on the same principles, but in the light of modern knowledge, might well be a complete success.

Curiosities Galore!

One of the by-products of this discussion is that a great deal of correspondence has been received on other curious types of engines—of the past, present, and one might almost say, future—if one goes by the optimistic forecasts



A Dawson engine fitted for tube ignition, owned by Mr. Gyatt, of West Croydon



Sectional view of the Dawson engine. (By courtesy of the "Motor")

of their inventors. Mr. J. B. S. Poyser, of Mansfield, whose letter on the subject was published in the issue of THE MODEL ENGINEER dated September 22nd, 1949, refers me to several interesting petrol engines of the pioneer days, including the vee-twin Daimler, with automatic inlet valves, and exhaust valves operated without gears, through the medium of a "tramway" groove cut in the face of the internal flywheels (a similar device was used in the ingenious Motasacohe cycle motor unit). Also a number of opposed twin engines, including the Henroid (apparently the forerunner of the orthodox "flat twin"), and the Turgan and Foy, which had two crankshafts, and introduced the principle of balancing later employed by Lanchester. Several opposed double-piston engines appeared in early days, and Mr. Poyser quotes those made by Mees, Koch and Riancy, also the Arrol-Johnson (not Argyll, as stated in his "Practical Letter" mentioned above), to which I may add the still more remarkable Gobron-Brillie. All these engines had single crankshafts,

to which the lower pistons were coupled by the usual form of connecting-rod, and the upper pistons by long rods on either side of a cross beam, as in the modern Doxford engine and certain types of Junkers engines. It may be remarked that another modern opposed-piston engine developed by the well-known firm of Sulzer has the cylinders arranged horizontally, with the crankshaft below it, and may be regarded as an up-to-date re-incarnation of the beam engine.

Of the many other ideas for unusual forms of engines which have been brought to my notice—most of which have not progressed further than rough or elaborate drawings, or at most, patent specifications—I do not propose to give more than one actual example, as it is the only one which appears to have been worked out in detail. It is only too easy to evolve what seem to be brilliant ideas for improving the functional design of engines, but to develop them in a practical form is quite another thing altogether. Ideas which seem perfect on paper have a habit of losing their glamour when one attempts to make them work; and even when they have definite merits, the new problems involved by comparatively minor departures in design may result in protracted teething troubles which are a severe test of patience and perseverance.

So far as the mechanical design of engines is concerned, it is very difficult indeed to improve on simple and basic principles; the most ingenious of swashplates, track cams, and rotary pistons have nothing on the two-centuries old crank and connecting rod of Jamie Watt. And for valve gears, the crude and brutal poppet valve still holds its own, because it has the ability to stand up to punishment. It has outlived the double-sleeve valve, with which the Daimler and other companies persevered for over 20 years, but eventually dropped—and it may be observed that the single-sleeve valve was invented still earlier, but only within recent years has it been found possible to demonstrate its potential advantages in practice. But that is no reason why we should disregard any possibilities of improving engines, or neglect to take advantages of the experiences, and even the failures, of those before us who pursued this thorny path!

An Opposed Concentric-Piston Engine

Mr. R. C. Hammett, of Danson Park, Kent, who is better known to readers as a locomotive and traction engine enthusiast than in connection with i.c. engines, has brought to my notice the patent specifications of a very interesting engine designed by Messrs. W. Quilter and J. S. Wilkerson, and has loaned me a file of drawings and technical data, also a wooden model demonstrating the mechanical principles of the engine. The latter embodies the salient features of the opposed-piston type of engine (such as the Doxford, Junkers and Fullagar), including such advantages as dynamic balance, pressure balance, and end-to-end scavenge, but having a modified mechanical system in which each working unit comprises two complete power cylinders, and may be defined as "double-acting," to all intents and purposes.

This is effected by using opposed cylinders on either side of the central crankshaft, each of which contains two concentrically-arranged pistons, the inner of which is of the conventional "trunk" type, while the outer is in the form of a sleeve with a closed end. The two pistons are connected by articulated rods to opposed crank throws, so that they move in opposition to each other; a convenient arrangement being to use a three-throw crankshaft, with the inner piston connected to the centre crank pin and the outer one connected to the side crankpin, as shown in the diagrams. The space between the inner and outer pistons forms the combustion chamber and working cylinder, the outer piston being ported so that it forms a sleeve valve, and also having an automatic transfer valve in its closed end.

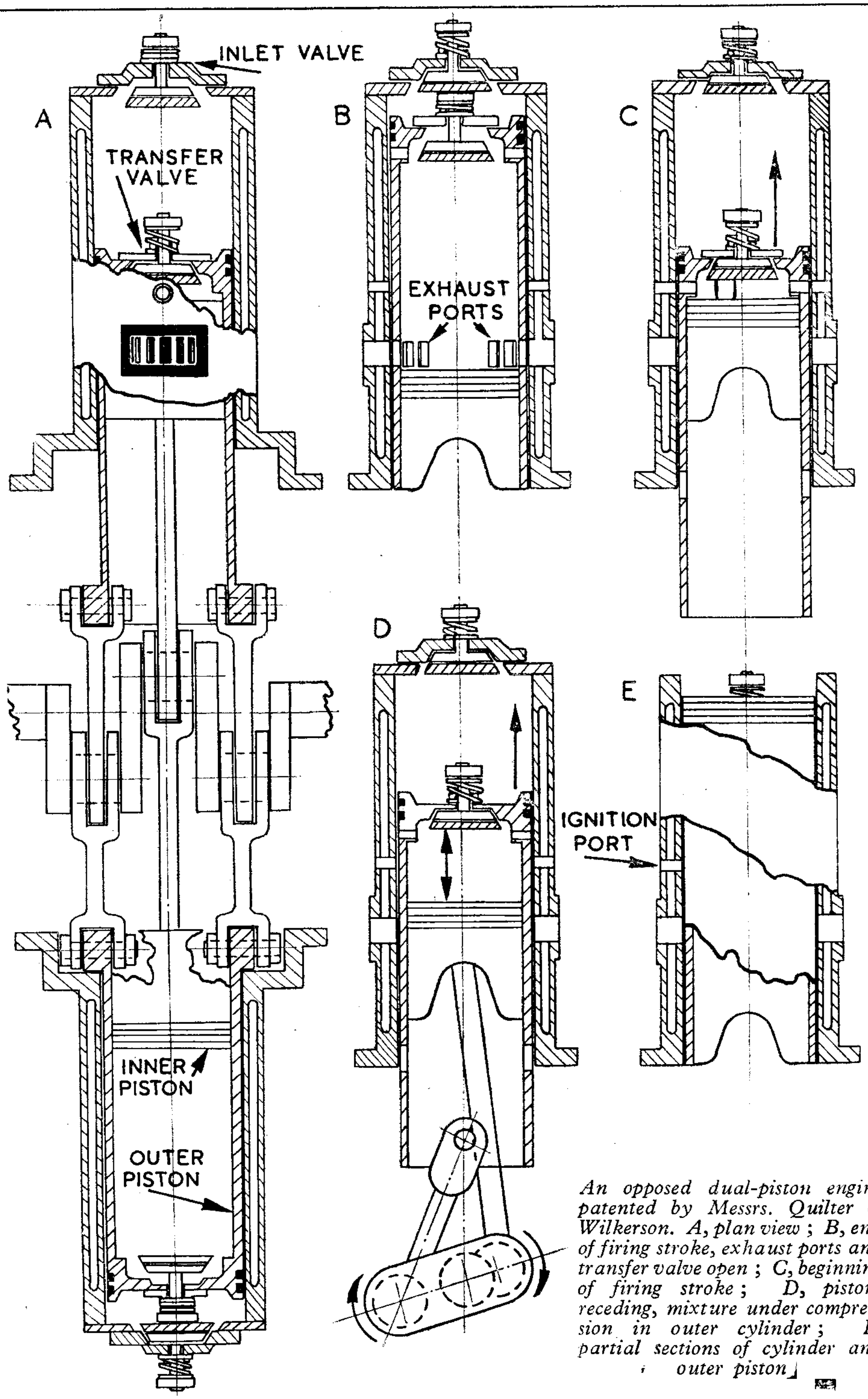
The fixed outer cylinder acts as the charging pump or pre-compression chamber for the working mixture, in which the closed end of the outer piston effects the required displacement, and an automatic inlet valve is fitted in the end cover for admitting air or combustible mixture. Provision for igniting the charge in the inner cylinder may be arranged by a port in the moving piston sleeve, registering at T.D.C. (i.e. when the space between inner and outer pistons is reduced to the minimum), with a port in the outer cylinder in which a sparking plug or other form of ignitor (or a fuel injection valve in the case of a compression-ignition engine), is fitted. A water jacket, or fins for air-cooling, are provided around the outside of the outer cylinder.

Operation of the engine follows the normal two-stroke cycle, and calls for little explanation. As the outer piston is moving away from the cylinder end cover, a depression is created in the space between them, causing the automatic inlet valve to open, and mixture to be drawn in. Simultaneously, the space between the inner and outer pistons is decreasing, corresponding to the compression stroke of a normal engine, until at the end of the stroke, the ignition port is uncovered and the charge fired. The return stroke corresponds to the normal firing stroke; at the same time the charge in the outer space is pre-compressed. Near the end of this stroke, the exhaust ports are uncovered, releasing the pressure in the working cylinder; the transfer valve is then opened by the difference in pressure in the inner and outer spaces, and the fresh charge flows into the working cylinder. As seen in diagram *B*, the transfer valve can be arranged to open positively, by contact of its stem with the head of the inlet valve in the end cover.

It will, of course, be evident that the same operations take place in the opposed cylinder of the engine, and as many units as may be desired may be used in building up a complete engine. For a compact, high-power engine, four banks of cylinders could be arranged at 90 deg., instead of the 180 deg. or "opposed" arrangement shown. The drawings suggest quite a large engine—5½ in. bore × 6½ in. stroke—but it is not clear whether such an engine has actually been built.

While this type of engine would appear to offer some definite mechanical advantages over the

(*Continued on page* 310)



An opposed dual-piston engine patented by Messrs. Quilter & Wilkerson. A, plan view ; B, end of firing stroke, exhaust ports and transfer valve open ; C, beginning of firing stroke ; D, pistons receding, mixture under compression in outer cylinder ; E, partial sections of cylinder and outer piston

Novices' Corner

A Tapping Handle for the Drilling Machine

MENTION was made in a previous article of the advantages gained by using the drilling-machine for light tapping operations, and, to rotate the tap, it was suggested that a lathe carrier or similar fitting could be attached to the upper end of the drilling spindle. A more convenient way, however, of turning the spindle is to use a suitable form of handle specially made for the purpose. A tapping handle that has been found serviceable for this purpose, and has been in use for many years, is illustrated in the photograph, Fig. 1, and the detailed dimensions of the component parts, together with their reference letters, are given in the drawings in Fig 2.

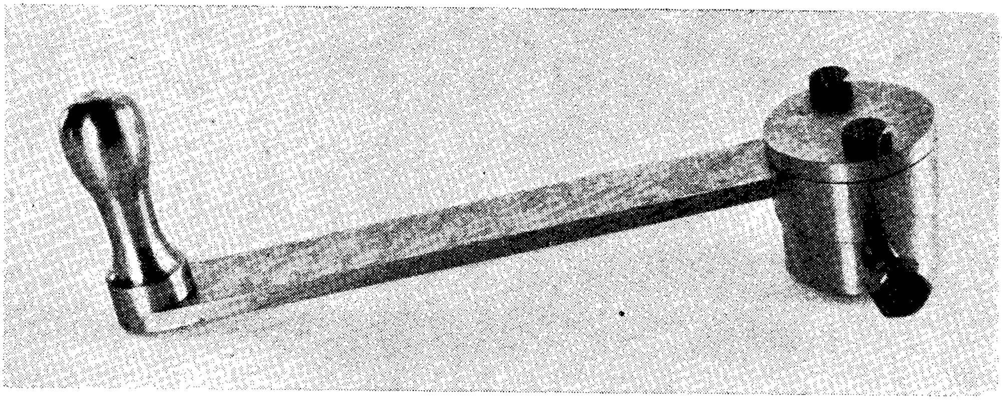


Fig. 1. Tapping handle in the fully extended position

The body (*A*) of the attachment should be made first, and to do this a short length of 1 in. diameter round mild-steel is gripped in the self-centring, or four-jaw chuck. After the end of the work has been faced, its outer diameter is turned to a good finish by using a sharp right-hand knife-tool, or a tool with a rounded point, and not by applying emery paper to the surface. To avoid the part having a clumsy appearance, the lower half of the body is reduced in diameter to $\frac{7}{8}$ in. or so.

Next, the work is drilled with a centre drill, mounted in the tailstock chuck, to make a guide centre for the $\frac{1}{8}$ in. diameter pilot drill, which is then fed in for a depth slightly in excess of the full length of the body. This hole is enlarged by drilling, in one or more stages, until its diameter is slightly less than that of the drilling machine spindle, but it is inadvisable to drill too near to the finished size because, should the drill not follow a straight path, too little metal will be left for the boring-tool to true the hole.

A small boring-tool is next used to finish the bore so that the body will slide on to the drilling-machine spindle. To keep the boring-tool as rigid as possible, it should be set to project from its holder no more than is needed to bore the hole to the full depth. When fitting parts in this way, the operation will often be facilitated if, as a preliminary measure, a piece of material for use as a fitting gauge is turned to the exact diameter of the drill spindle. As an alternative, it may be found, on taking a measurement with the calipers, or the micrometer, than the shank of a twist drill or a piece of rod is of the same diameter as the spindle and so will serve as a gauge. The use of a fitting gauge in this way will save having to remove the work from the chuck; but if, for any reason, the work has to be taken out of the chuck before the machining is completed, a punch-mark should be made exactly opposite the centre of No. 1 jaw so that the setting is preserved when the work is replaced. The body can now be parted-off to length, and, when it has been reversed in the chuck, the upper surface is faced. This surface is painted with marking fluid, and two parallel lines, $\frac{1}{2}$ in. apart, are scribed to denote the seating for the hand lever (*E*); at the same time, the centres for the two clamp-screws (*C*) are marked-out and centre punched.

The lever seating can, perhaps, be most easily marked-out by clamping the piece of material, used for the lever, centrally on the body with a toolmaker's clamp, and then scribing along the edges of the steel strip. If the centres of these two parallel lines are marked-out with the aid of the dividers, a line drawn through these two points will denote the centre-lines of the two clamp-screws. The cross-centre lines of these screws are marked-out from the edge of the body by using the jenny calipers, and, at the same time, these calipers are also employed to mark the depth of the lever seating.

To form the lever seating, two cuts are made with a small hacksaw just short of the scribed dimension lines, and the redundant metal is removed by filing until the gap is just too narrow to admit the lever. As an alternative, this slot can be machined with an end-mill mounted in the lathe chuck, whilst the work is gripped in the machine vice attached to the vertical slide. The holes to receive the clamp-screws are drilled at the marked-out centres with a No. 32 drill and held against the body, and file the end of the lever to this curvature.

The position of the hole to receive the handle (*F*) is marked-out with the jenny calipers, and, when the centre has been marked with a centre-punch, the dividers are used to scribe the radius formed at the end of the lever. Enlarge the marked centre with a centre drill and drill through with a ¼-in. drill. It is usually inadvisable to ream a hole, such as this, in thin material, for

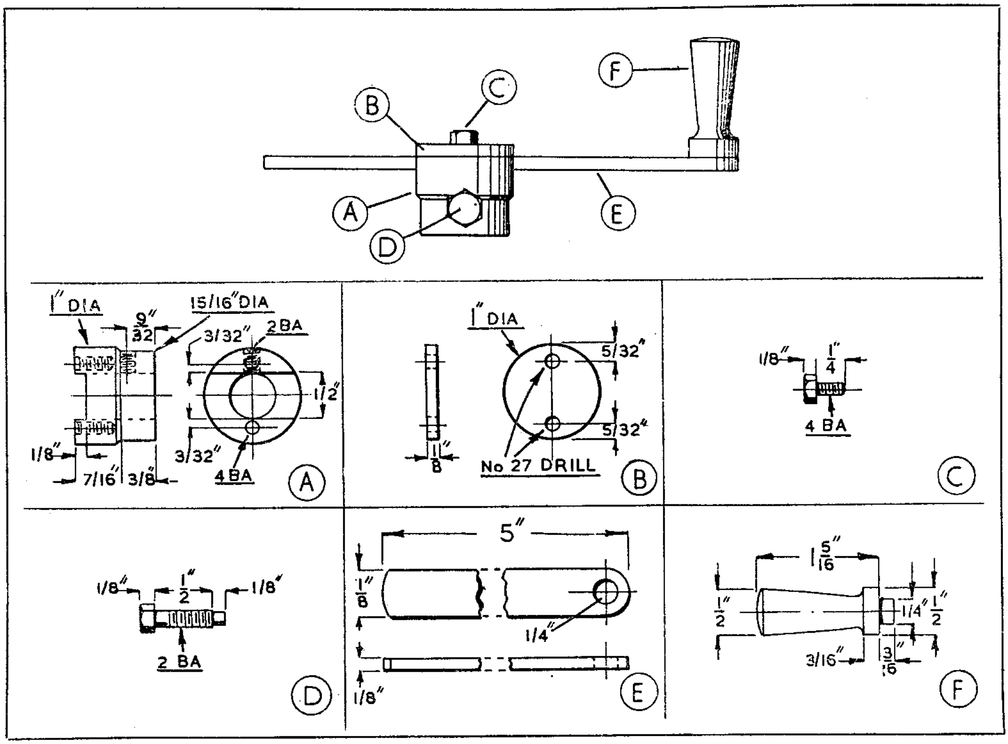


Fig. 2

then tapped No. 4 B.A. To complete the work on the body, the position or the clamp-screw (*D*) is marked-out with the jenny calipers, and a hole is then drilled with a No. 24 drill for tapping 2 B.A.

The cap-piece or clamping plate (*B*) is parted-off to the correct thickness from a piece of 1 in. diameter material turned to the same diameter as the body; or alternatively, the part can be made from the piece of turned material remaining in the chuck after the body has been parted-off. The holes for the clamping-screws are marked-out on the cross centre-line with the jenny calipers set as for marking-out the body, and the screw-holes are drilled to the clearing size with a No. 26 drill.

A length of ½-in. by ⅛-in. mild-steel strip is used to make the hand lever (*E*), and, after it has been filed to a good finish, the sides at one end are carefully draw-filed to make the part a good sliding fit in the seating formed in the body. Scribe across the projecting end with the scriber if the reamer is not kept in true alignment, the lever handle when in place will not stand upright. The lever is finished by filing its end to a semi-circle in the manner described in a previous article. Although a handle with a curved contour is shown in the photograph, it will be found easier to make the part of the straight tapered form depicted in the drawings. A length of ½ in. diameter round mild-steel is gripped in the lathe chuck and its end is reduced in diameter for a length of ½ in. to make the shank a press fit in the lever.

Next, the outer diameter is turned to slightly less than ½ in. to give a neat appearance when the handle is mounted in place. The tapered portion is formed with a left-hand knife tool, having a tip formed to a small radius, and the top-slide which is used to traverse the tool is set over to an angle of approximately 1 deg. The turning operation is carried out from left to right, as represented diagrammatically in Fig. 3. The whole length of the taper should not be formed

at a single cut, but is machined in stages. The cross-slide is used to bring the tool into contact with the work at a point about ½ in. from its end, and a cut is taken towards the tailstock to form the shoulder. The tool is then brought into contact with the work at a point farther towards the left, and this operation is repeated until the taper has been formed to its full length. Care must be taken to feed slowly as the tool approaches the shoulder, and, if chatter develops the speed of the lathe must be reduced.

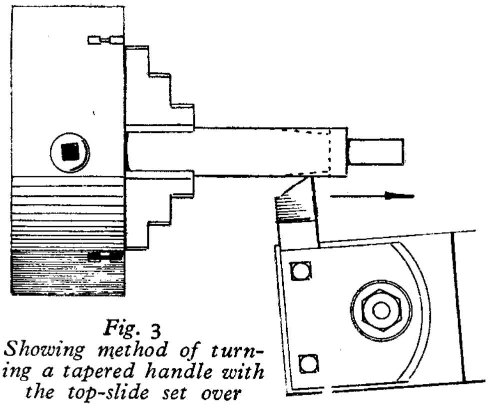


Fig. 3

Showing method of turning a tapered handle with the top-slide set over

Before the handle is parted-off, the end of the ¼ in. diameter portion is made slightly tapered with a fine file applied to the rotating work. The part is next reversed in the chuck and the top of the handle is finished by taking light facing and chamfering cuts ; but, as the chuck-hold on the slender end portion affords but little rigidity, great care must be taken in feeding the tool. The handle is now transferred to the drilling-machine for polishing with fine emery cloth. The bench vice is employed to press the handle into place in the lever, and after the projecting end of the shank has been cut off and filed nearly flush with the lever, it is lightly riveted over.

Stock, round- or cheese-headed screws can be used for the clamping-screws (*C*) and (*D*), or these may be of the hexagon-headed form shown. Where necessary, the tip of the screw (*D*) must be reduced in diameter to fit into the keyway formed in the drill spindle. If on assembly it is found that the clamp plate does not secure the lever when the clamp-screws are tightened, this can be corrected by mounting the body in the chuck again, and taking a series of light cuts over its upper surface until clamping pressure is established.

When carrying out tapping operations in the drilling machine, to secure the attachment in place, the screw (*D*) is firmly tightened after it has been engaged in the keyway of the drill spindle.

The leverage obtainable can be adjusted at will by slackening the clamp-screws (*C*) and sliding the handle lever in the body ; these screws are then tightened to clamp the lever firmly in position.

Petrol Engine Topics

(*Continued from page* 307)

normal form of two-stroke, it suffers from the same basic limitations, and would undoubtedly be a rather expensive engine to produce. The problems in producing concentric sleeve valves which will stay accurate and stand up to working strains at high speed have worried production engineers for half a century, and have not yet been completely overcome. Cooling problems are liable to be accentuated in an engine of this type, as the heat must be conducted through two metal walls, with an oil film between them.

The disadvantages of crankcase compression are eliminated in this engine, and any desired ratio of pre-compression can be obtained, though in practice, it is not usually found that a high pre-compression is of any real advantage, as it increases the amount of work expended in pumping, and thereby lowers mechanical efficiency. It will be noted that the stroke of the outer piston in the outer cylinder is only half the effective stroke produced by the opposed movement of inner and outer pistons in the inner working space ; but the area of the outer piston head is greater than that of the inner piston, which compensates for this to some extent.

The use of automatic valves in any shape or form is hardly likely to be regarded with favour by any i.c. engine manufacturers at the present day, the lessons of the past being that they are inefficient and troublesome in high-speed engines. It may be noted, however, that the inventors of this engine have suggested modified forms of design in which sleeve-controlled ports may be substituted for automatic valves ; the internal functions of the engine then being identical with those of the normal three-port " valveless " two-stroke. A number of other interesting variations of the engine have been suggested, and a design for a very ingenious rotary engine also produced by the inventors.

(*To be continued*)

Hints on Making Collets

by J.K.M.

THIS article is intended to provide notes on the making of collets of the kind shown in Fig. 1, where *A* is the collet held in an adaptor *B* by means of a closing ring *C* Experience with this type has shown that very accurate results may be obtained, provided the proper procedure is used in turning and slitting them. Various easily obtained materials have been used and mild-steel has proved satisfactory provided care is taken both in manufacture and subsequent use.

Fig. 2 shows the proportions of a collet suitable for the average size of bench lathe, where it will be seen that the included angle of the cone should be about 40 deg. The bore *B* should be approximately 1/32 in. larger than the largest size stock it is intended to chuck and the diameter of the body *B*1 should provide for a wall thickness of about $\frac{1}{16}$ in. thus making $B1 = B + \frac{1}{8}$ in. Since the three slots in the collet have to be cut with a slitting saw, an extension piece should be provided so that they may be held securely in a simple fixture which will be described. The extension consists simply of a parallel portion, turned to some convenient diameter as indicated in Fig. 3. This is parted off when the slitting operation is complete.

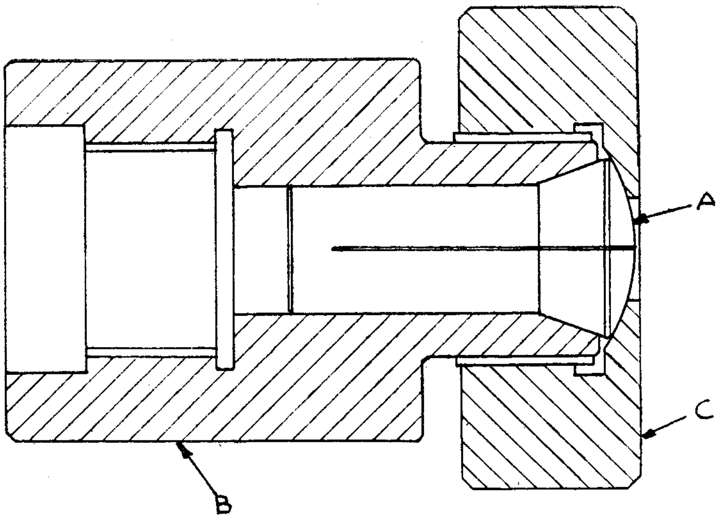
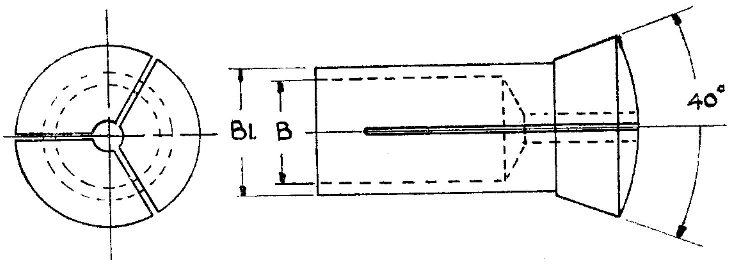


Fig. 1

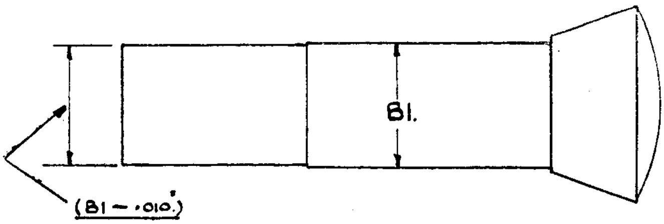


Right—Fig. 2. *Collet for bench lathe*

The work of making the collets is divided into four separate parts, viz: (1) Rough turning; (2) Finish turning; (3) Boring to size; (4) Slitting and parting off the extension piece, and it is necessary that these operations should follow one another in the numerical order indicated.

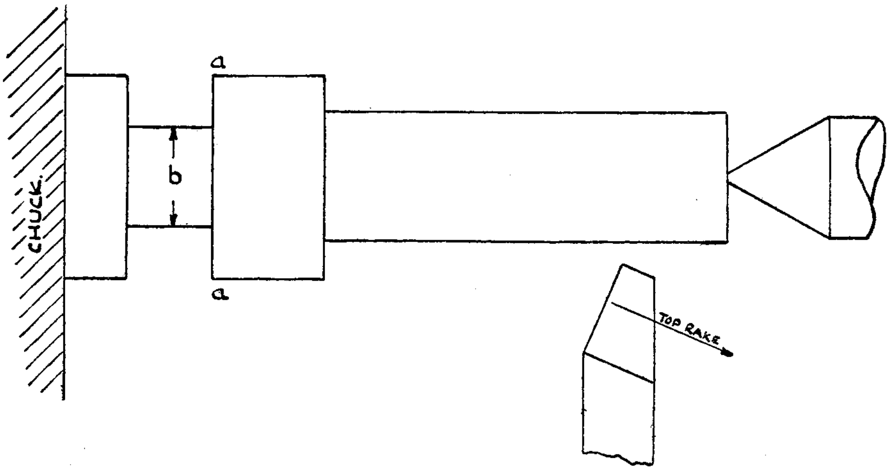
(1) Rough Turning

It is important to treat this as a separate and distinct operation. Any attempt to finish-turn a locating surface (such as the 40-deg. cone, or the curved nose which contacts the closing ring) before the remaining portions have been roughed out will almost certainly lead to errors in the finished job. The bar should first be held in the chuck and the end faced and centred. The tailstock can then be employed to give additional support. Roughing cuts are then taken so as to leave all diameters about 0.020 in. to 0.030 in. oversize. An excellent tool for roughing out steel is shown in Fig. 4, where the shape of the work after rough turning is indicated. A



Left—Fig. 3. *Collet blank with extension*

Below—Fig. 4



round-nose tool and knife tool will have to be used to clean out the shoulder *aa* and the diameter *b* and the latter should be somewhat less than the hole in the closing ring (*C* Fig. 1). The last operation at this stage is to drill the hole in the body. It will be advisable to put a small drill through first and open out in steps with larger drisll, taking care to see that the finished hole is reasonably concentric. A small error is permissible in this respect, but, as will be described, the hole is used to index the collets for slitting, so it should be drilled as accurately as possible. If, however, the drill does "run out" by a small amount, the work need not be scrapped.

(2) Finish Turning

This is carried out with a sharp round-nose tool and the parallel portion of the collet should be a neat, close fit in the adaptor. Similarly, the extension piece should be turned to the same diameter on each collet so that all will fit in the hole in the slitting fixture later on. The lathe top-slide is set over 20 deg. to turn the cone and when this is finished it should be checked with marking blue for a good fit in the adaptor. At first sight it may seem a disadvantage to have to make this setting by trial and error each time a collet is made, but in practice it can be done very quickly and is much easier than, for example,

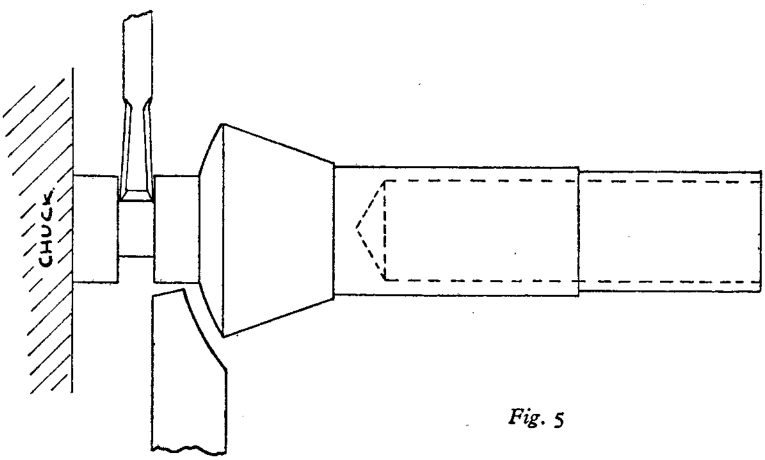


Fig. 5

turning a morse taper. No attempt should be made to finish the surface with a file or emery cloth—a good smooth machine finish is the key to an accurate job in this case. A portion of the curved nose of the collet can be machined by means of a simple form tool as shown in Fig. 5. A tool without top rake has proved satisfactory provided the lathe is put in low-gear and a copious supply of cutting oil provided. Lastly, the partly-made collet is parted off so as to leave a parallel portion about 3/32 in. wide at the front (Fig. 5).

(3) Drilling and Boring to Size

This is done with the collet blank held in position in the adaptor. The latter should be cleaned out before fitting on the lathe nose so that no swarf or dirt can interfere with its proper location. The collet is carefully centred using very light pressure on the centring drill and in the small sizes the collet can be drilled straight through with the drill in the tailstock chuck. It will be a great help if a very short drill, a size smaller than the finished diameter, is put through first and if there is any doubt about the proper grinding of the sizing drill, it is not a bad investment to buy a new one especially for the purpose.

For collets above about 7/32 in. or ¼ in., drilling, by itself, has been found unsatisfactory and the holes should be bored to size and also reamed if possible.

After this part of the work has been done the 3/32 in. projection is turned away to conform to the surface already made with the form tool.

(4) Slitting

The writer has used with success the simple set-up shown in Fig. 6. No sizes are given, since like the collets themselves, these will vary in individual cases. The sketches, however, are to scale and this may assist in arriving at suitable sizes. It will be seen that the collet is secured in a steel block bolted to the rear of the cross-slide. The block is bored to receive the extension on the collet, which can be clamped in place by means of the bolt shown. The indexing device consists of a 60-tooth change-wheel mounted on a short spindle which is a push-fit in the hole in the body of the collet. A brass pointer is clipped under the right-hand bolt securing the block to the cross-slide, and is used as a datum for indexing. Every 20th tooth on the gear wheel is marked with a bold, scribed line, and indexing proceeds by simply "sighting" the line against the pointer.

The slitting saw shown in Fig 6 was 0.028 in. thick and had a diameter of 1¾ in.

The Set-up in Use

To use this set-up the lathe cross-slide should be adjusted so that its movement is fairly stiff and the collet clamped in position with the pointer in line with one of the marks on the gear wheel. The position of the saddle on the bed is then adjusted so that the saw will cut centrally into the collet and when this has been done, the saddle is locked. The work should now be fed carefully up to the rotating saw and a very fine feed employed until the saw has got past the conical portion. After this, the feed can be increased since the area of metal in contact with the saw

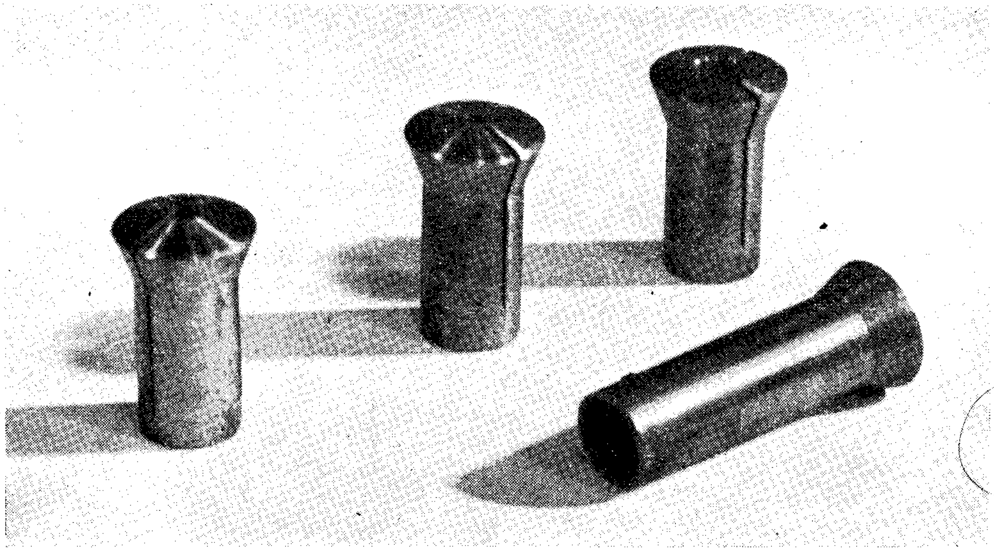


Photo by] [*Montague Fisher Ltd.*

Finished collets and (right) collet before slitting, with extension piece

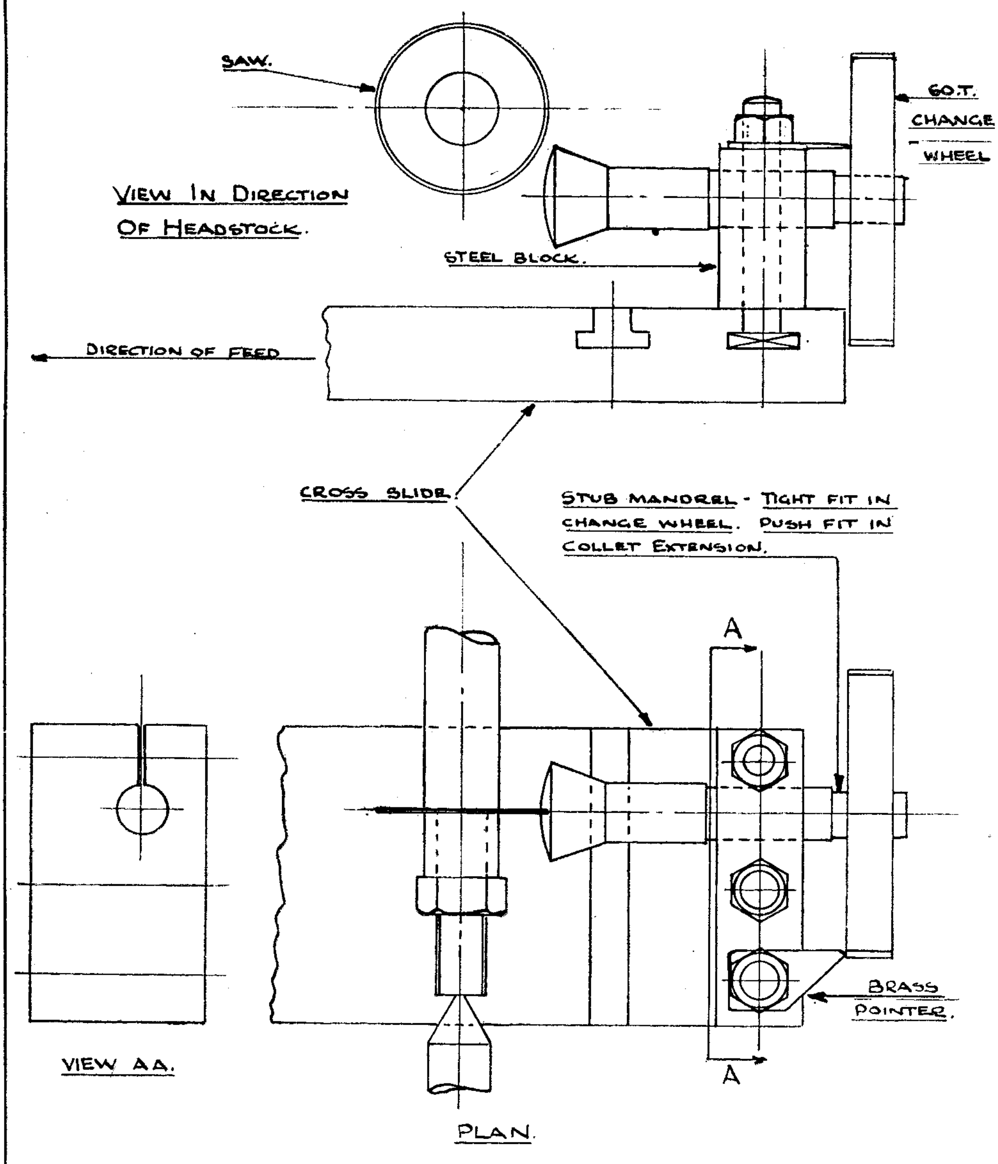


Fig. 6. Set-up for slitting collets

is much less, as also is the overhang of the collet in relation to the fixture.

Speeds and Feeds

It is difficult to lay down rules for speeds and feeds for this kind of work since so much depends on the condition of the machine and other variable factors, but as an indication of what may be done, the writer has used the slitting saw referred to, running at 100 r.p.m., and employed feeds of about 0.002 in. and 0.005 in. per revolution for the heavy and light sections of the collet, respectively. This was done with the saw running unavoidably eccentric and no doubt these feeds could have been substantially increased if the saw had run truly on the mandrel.

After the slitting operation, the collet is held in the chuck by the extension and parted off.

Wolf Electric Solderguns

THE house of Wolf needs no introduction to readers of THE MODEL ENGINEER. As manufacturers of high quality electric tools of all types, they have a world-wide reputation for reliability, and their latest introduction to the engineering field, in the form of a range of electric solderguns, is a worthy addition to their list.

As in industry, model engineering soldering requirements call for tools which will reach operating temperature quickly, maintain a correct, constant heat, prove economical in consumption and be of a size and weight which will enable delicate work to be handled for prolonged periods without fatigue to the operator.

The illustrations show two irons from their range of six hand models, and particular attention is drawn to the angled hand-grip, specially designed to improve comfort and control in handling.

The element has been so arranged that heat is localised around the copper bit, and with the elimination of wasted areas considerable economy in current consumption has been effected. Also, tendency towards excessive rise in temperature is avoided, and this in turn ensures extension of heating element life and saves oxidation of the copper bits.

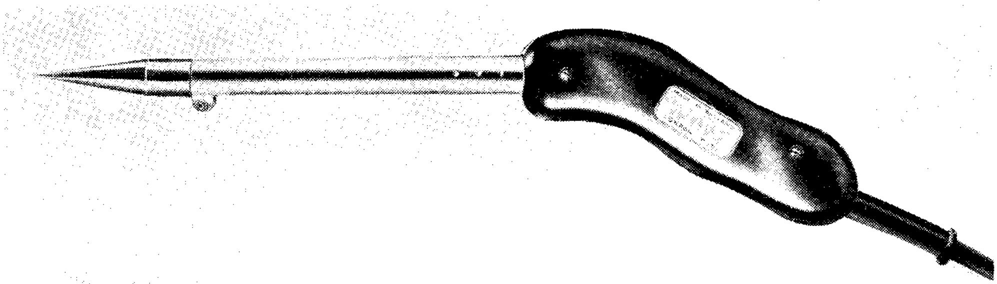
Following are the voltages for which these guns can be supplied :—

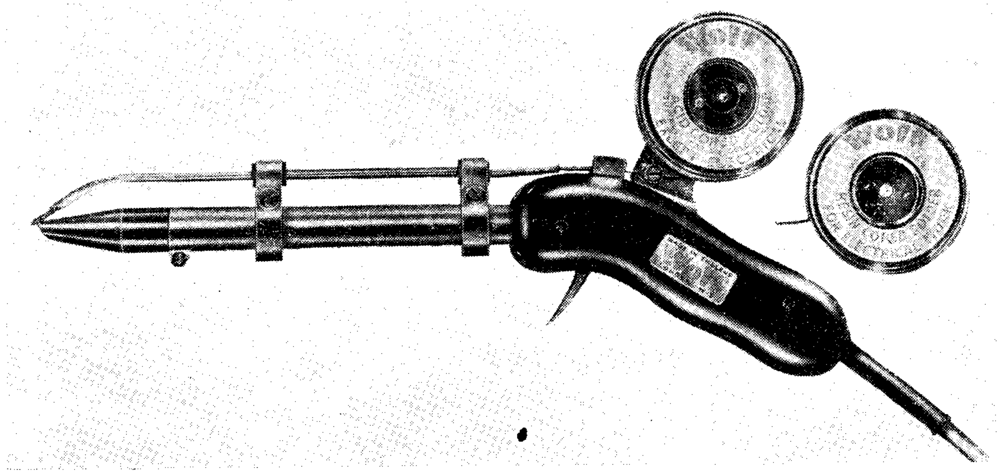
24, 50, 100/110, 115/130, 200/220, 225/250.

Models are available for a wide range of purposes from fine instrument and model makers' work to heavy duty requirements.

From our past experience of Wolf products, we have every confidence in commending these new appliances to any of our readers desirous of possessing a really first-class tool.

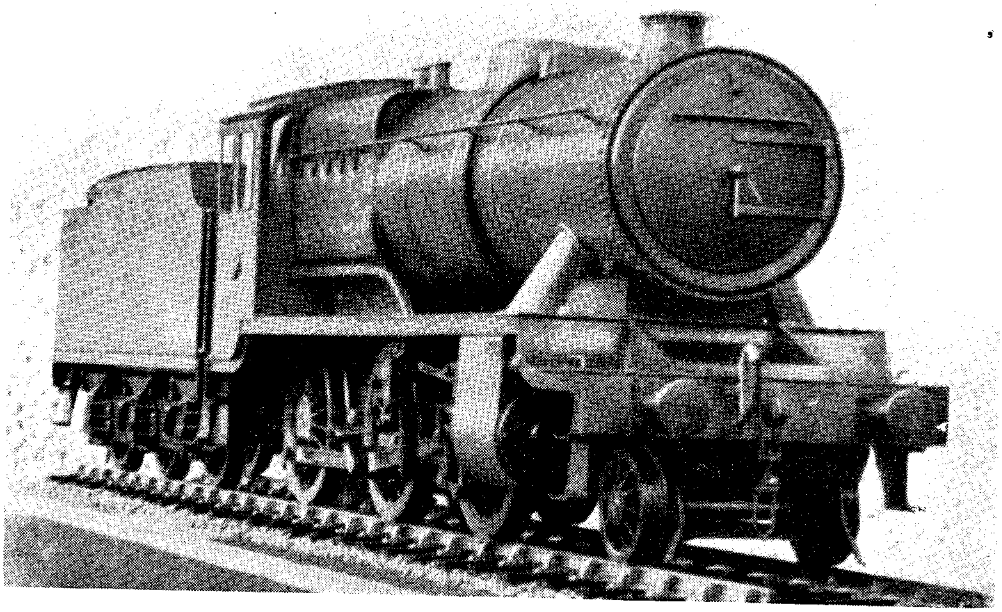
Further details may be obtained on application to the makers, Messrs. Wolf Electric Tools Ltd., Pioneer Works, Hanger Lane, Ealing, London, W.5.





Above—A light, handy tool which will be found useful for fine work.
Below—The Wolf solder gun, which solves many single-handed problems with almost incredible ease. Note the trigger feed and guide tube

"The MacDyak" by "L.B.S.C."



HERE are some pictures and a few notes about yet another locomotive built to the design I schemed out for the "Silver Casket Competition," way back in 1934. Judging by the castings and materials sold, and the amount of correspondence received during the last 15 years or so, there must be *Dyaks* in every part of the world. The example illustrated is a Scottie, being "born" in Ayrshire, and is the handiwork of a cinema proprietor, Mr. Thomson Arnott, of Largs; and he has put some very fine work into her. Whilst the general construction is according to specification, some refinements are incorporated, such as a snifting valve on the smokebox *a la* L.N.E.R., top feeds similar to those I specified for *Doris*, but conceived independently ("great minds" again!), and the L.M.S. deep-tone whistle. Cylinder drain-cocks are now being installed, operated from the cab by a piano wire inside a small-bore tube. Extra details include lamp irons, front end steps with non-slip side flanges, and grab irons. The engine is also arranged for right-hand drive, and has a wheel-and-screw reverser, the screw having a three-start thread.

"Bro. Flix" is certainly not lacking for patience and care in his workmanship. All the superstructure is riveted up, as you can see, with 1/32-in. rivets; and all the holes—over 2,500 of them—were drilled with a hand brace. Our worthy friend says, no more of that lark, and is making up a sensitive drilling machine ere he tackles his next locomotive, which will be *Doris*. All the valve-gear pins were either lapped to a dead fit, or finished with a watchmaker's Swiss pivoting tool; and as all the holes are dead to specified centres, the valve timing is "spot on." Most of the hexagon bolts and set-screws were home-made from round rustless steel, the heads being milled to correct shape. Instead of the main and pilot holes in the regulator, a single pear-shaped port is used; and when the boiler was tested to 160 lb. water pressure, with the regulator valve in place, there was no sign of leakage.

When the chassis was tested from a stationary boiler supplying wet steam at 60 lb. pressure, it was impossible to hold the wheels, and the beats were sharp and even in both directions of motion. It will also turn over at 60 revs. per minute, perfectly even, without hesitation. The engine has not yet been tested for hauling power; but our friend says he has heard that a similar locomotive owned by somebody in the Nobel's Works Recreation Club (Live Steamer's Section) has pulled five adults on the club track, and he hopes to be able to have a run on the same track, and see how many his own engine can manage. He says if it is only two, he will be pleased; but there is no reason why it should not pull the big load. My own engine *Dyak Queen* had no trouble in humping five adults up and down the old straight line, partly in a cutting, which did duty as a test road before my present non-stop line was installed.

Any readers in Largs and district who would like to see the engine, will be able to do so, as she will be shown operating under compressed air in the window of the local garage. I've told "Bro. Flix" he ought to get a cine-camera on

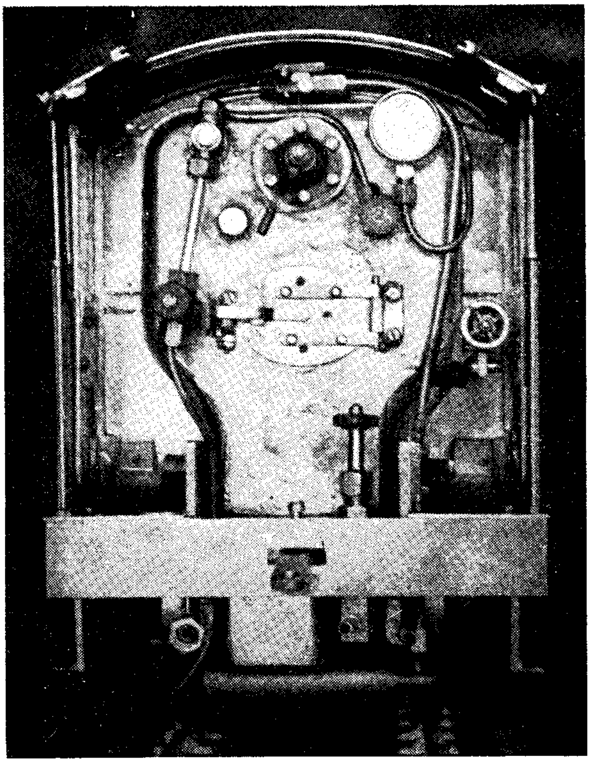
the job, when he makes his mighty-hauling test, and show the result on the screen at his cinema.

"'Ints and Tipses" on Injector Making

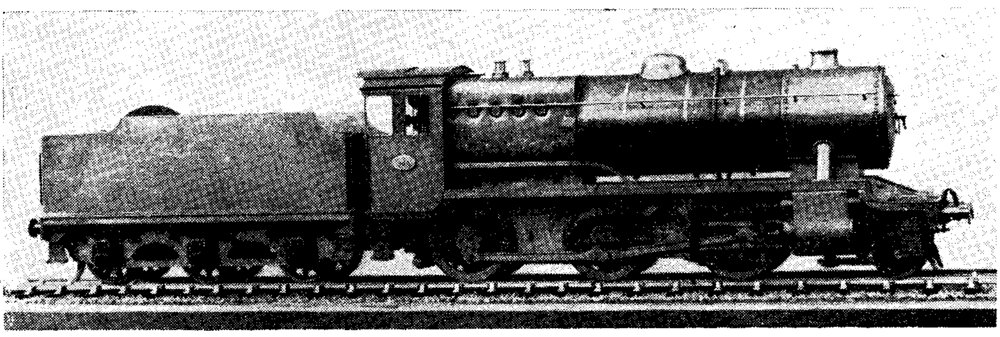
May I once more impress on those good folk who make, or contemplate making injectors, that as long as my instructions are followed *exactly* —and I mean just that — the injectors will work, and continue to work indefinitely ; the only proviso being, that (as in full size) the cones must be kept clean. I have already mentioned that in practically every case in which an injector has refused to operate, the instructions have *not* been followed ; where they have, the fault hasn't been in the injector at all, but in the piping, steam or water valves, or defective boiler clack. The principal faults are : incorrect size of the throat of the delivery-cone, which is the most common, and most fatal ; variation in sizes of the other cones ; incorrect shape of outside of steam-cone ; bell-mouth of the delivery-cone not tapered enough ; combining-cone loose in body ; ball-valve not seating air-tight ; and last but not least, incorrect spacing of the cones.

I have dealt with most of these faults in these notes ; but despite that, letters still come in complaining that injectors won't deliver at all, or else there is an excessive dribble at the overflow, or the pressure range is only a few pounds. I do earnestly ask everybody who has made a faulty injector, to go over it very carefully, and re-check *everything* against my instructions ; if they will only do that, and remember that the variation in size of the hole drilled by, for example, a No. 75 drill and a No. 74 drill, will mean all the difference between success, and partial or complete failure, then the fault will be apparent. Over the Christmas holidays I made a dozen injectors ; and the only trouble I had with the lot, was two of them dribbling because the hose connection to the tender tank had split, and allowed air to be drawn in with the feedwater. As air won't condense in water, the jet lacked the necessary velocity, and part of it ran out of the overflow pipe. A new tender hose connection cured the trouble immediately. The little gadgets have gone overseas to friends as gifts " for services rendered "—Curly's " export drive " that didn't bring any in dollars, but something far more valuable, viz. a feeling of good will.

Blunt-nosed steam-cones, wrong-size holes, wrong tapers and so on, are just the results of

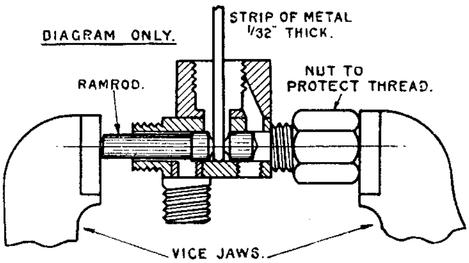


A neat footplate—note " sunshine roof "



Nice work by Mr. T. Arnott

indifferent workmanship, and the remedy lies in the maker's own hands. Why on earth the press-fit of the combining-cone should be such a stumbling-block to many amateur turners, is something that "gets me beat," as the saying goes. Even the rawest recruit can get a press-fit by the method I have already given ; but for new readers' benefit, here it is in a nutshell.



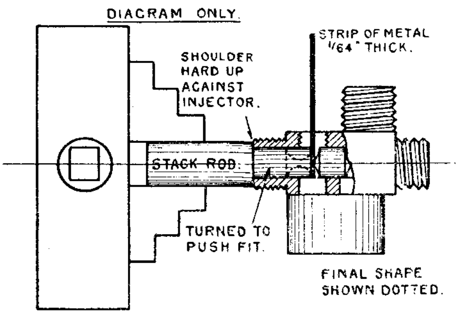
How to space the halves of combining cone

Simply put a taper broach down the steam end of the injector body (the end in which the steam-cone fits) and take a scrape out of it, for $\frac{1}{8}$ in. or so. When you turn your combining-cone, which is fitted first, turn it to such a diameter that it will just go very tightly into the extreme end of the broached part of the injector body. If the lathe turns reasonably parallel, the cone will then be a proper squeeze fit in the reamed hole which goes right through. Don't make the cone a sliding fit and then try to solder it. Both steam and delivery cones should be a fairly tight push-fit, so as to ensure that the holes through the whole bag of tricks, are all dead in line.

Here are a couple of dodges to get correct spacing. To space the two halves of a Holden-and-Brooke divided cone to the correct distance apart, you need a little sliver of metal about 2 in. long, $\frac{1}{8}$ in. wide, and approximately 1/32 in. thick ; two or three thousandths more or less, will make little appreciable difference. I made mine from a piece of a machine hacksaw blade. Round off the end. Press in the leading half of the cone, until the larger end of it is just half-way past the bottom of the hole under the air-ball seating. Drop the rounded end of the sliver of metal down the hole, then press in the second half of the cone until the sliver stands vertically, but not held tightly, between the halves. They will then be the correct distance apart. Put the cone reamer through the two halves now in place, and give it a few turns between thumb and finger, in case any burring has occurred in the pressing process ; and try the proper drill in the cone (No. 70 is the usual size for any engine between $2\frac{1}{2}$-in. and 5-in. gauge) to see that the hole is O.K. A 69 drill should not pass. If it does, however, use a 62 drill for steam-cone, and 74 for delivery, in place of 63 and 75, and the injector will still work all right, though it will use more steam, and feed more water.

A similar gauge, approximately 1/64 in. thick, can be used to space the delivery cone from the combining-cone. The cones for my "standard" injector are turned from 7/32-in. brass rod held in three-jaw. Face the end, then turn down the outside to a fairly tight push-fit in the delivery end of the injector body. The length of the turned part should be equal to the length between the end of the combining-cone, and the end of the body where the check-valve screws on, less the thickness of the gauge. When the turned part is pushed right in, up to the shoulder, it should just be possible to get the gauge between it and the end of the combining-cone. This length being O.K. you can go ahead and turn the outside of the cone to the given shape and size, in full confidence that the spacing is correct. The diameter of the bell-mouth should be 3/32 in. ; then, if the stubby cone reamer is made to the size and curvature given in my notes on injector-making and used as stated, the distance between the combining-cone nozzle, and the bell-mouth "exit" will be correct.

To make sure the steam-cone enters the combining-cone to the correct distance, use a strip of metal 1/32 in. thick, and about $\frac{1}{4}$ in. wide, squared off at the end. Chuck the 7/32-in. brass rod, and turn down the end to a fairly tight push-fit in the body ; the end, of course, should be truly faced. Turn the piece to such a length, that when pushed in as far as it will go (that is, with the end touching the combining-cone) you can just insert the end of the strip of metal between the end of the injector body and the shoulder. Then turn the outside, drill and ream, and the resulting cone will enter the combining-cone 1/32 in., when the shoulder is tight up against the end of the body. The nozzle should measure between 0.053 in. and 0.060 in. on its outside diameter, close to the end.



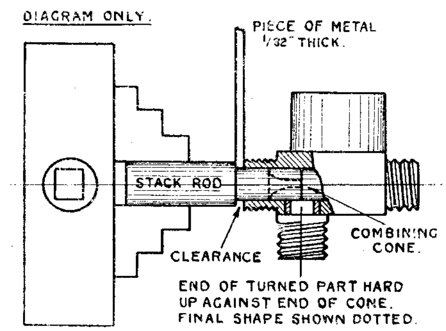
How to get length of delivery cone

Now one final tip. Readers complain that they set the ball-chamber on the body, carefully adjust it to the required position, anoint it with flux, blow to dull red as instructed, apply the silver-solder, and then the bluepencil ball-chamber starts to float about, and when the silver-solder sets, it is all cockeyed, as the kiddies would say. If they put binding wire around it, the wire gets "stuck" with the silver-solder, and has to be filed off, completely spoiling the pristine beauty of the whole issue. Well, you can easily get over that trouble. Make a pin-drill from a bit of $\frac{3}{16}$-in. or slightly larger silver-steel, with a short pin $\frac{1}{8}$ in. diameter ; I've described how to make pin-drills umpteen times. With this, pin-drill

a recess a bare $\frac{1}{16}$ in. deep, in the injector body, with the pin in the hole, over which the ball-chamber fits. Make the ball-chamber fitting about 1/32 in. longer than shown in the drawings. After drilling and tapping it, and forming the seating for the ball, screw it on to a weeny mandrel nose formed on any odd scrap of brass rod held in three-jaw. Then face off the end, leaving a little spigot around the hole under the ball-seat. This spigot should be about 1/32 in. long, and a tight fit in the pin-drilled recess in the injector body. Press it in, line up the air-ball chamber with the body, and silver-solder in the usual way. The fit of the spigot in the recess will prevent any movement, and of course, the holes will line up exactly, making it an easy matter to sight the halves of the combining cone, when pressing in. After seating the ball, take the depth from top of ball to top of chamber, as if you were making a clack or check valve, and turn the screwed part of the cap to the same length. After parting off, reverse in chuck, and make a countersink in the end of the screwed part with a No. 21 drill, penetrating just to the full diameter of the drill point. To prevent the ball going up into the recess and sticking there, as it will do if the countersink is full of water, file a slot right across the countersink; then, as we used to say at school "What goes up, must come down," and the ball will behave itself.

It's That Voice Again!

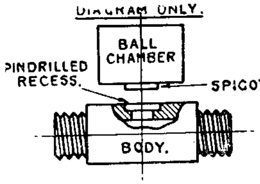
Our worthy brother who is "father of twins," when describing his duplex pump, mentioned in a friendly sort of way that he hoped he wouldn't

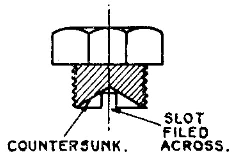


How to get length of steam cone

hear a voice saying that banjo-type unions, as specified for his pump, weren't found on big engines. Well, I sincerely hope he won't be scared to hear the same voice that made a crack about spam cans, on the footplate of *Lady Vera*, reply in the same friendly sort of way, that there certainly weren't any on the L.B. & S.C.R. engines in my time, anyway; least of all on the pumps! There were plenty of the ordinary type, of all sizes, and they never gave us any trouble; the smallest were on the lubricator pipes, and the water-gauge blowdowns, and the biggest were on the "feed-bags," as the enginemen always call the hose connections between engine and tender. These had circular nuts, with a couple of lugs sticking out, one at each side, and we used to tighten them up with a judicious clout or two from a lead hammer.

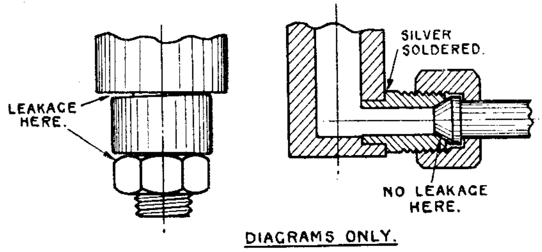
The idea of the banjo union is, that it can be attached with the connecting pipe pointing in any direction; in some ways, this is an advantage, especially in automobile work, but there is an attendant disadvantage. Unless the contact faces are absolutely true, the union will leak unless packing-washers are introduced. The motor





Fitting ballchamber to body *Cap for ball chamber*

folk recognise this, because the flexible petrol pipe on my gasoline buggy is connected to the carburettor by means of a banjo union, *which has a fibre washer on one side, and a copper-asbestos washer on the other.* To do without any jointing, you have four faces to machine up truly; the shoulder against which the banjo presses, both sides of the banjo itself, and the contact side of the nut. In the case in point, the pipes lie in one direction only, therefore the necessity for the swivelling union doesn't arise. For a right-angled connection at the bottom of one of my pumps, I should simply specify a union screw silver-soldered into the bottom valve-box cap, pointing in the desired direction. This is merely countersunk with an ordinary centre drill. The connecting pipe is furnished with the usual union nut and coned nipple. There is no chance



Favourite trick of unpacked banjo unions

of leakage due to untrue facing; the nut is connected and disconnected with the minimum of trouble, and you can't lose it, as it cannot come off the pipe; when the nut is disconnected, the pipe automatically parts company with the valve-box, which isn't the case with the banjo union, as it has to be sprung over the spigot, a nobby job if the pipe is short, without any spring in it. Re-connecting the coned union is just as easy, merely a matter of pushing the pipe in line with the union screw, and tightening the nut. When testing injectors, I'd just hate to have three banjos and three loose nuts to fiddle about with, when changing them "on the quick," on an engine in steam; using the ordinary type I can change an injector in a minute or less. However, different folk have different fancies; after all, the world would be a dull place if everybody thought alike!

An Engine Installation for Spur-Driven Model Cars

by G. W. Arthur-Brand

I SAID last week that you were then reading the last article in the series on *The Model Car News* " Grand Prix " Special. Well, so you were—that is, as far as the constructional angle was concerned. experience a certain amount of difficulty here, so I am going to describe this week how I mounted the " Rowell 60 " in the prototype. The same principles will apply with almost any single-cylinder engine arranged for spur drive in

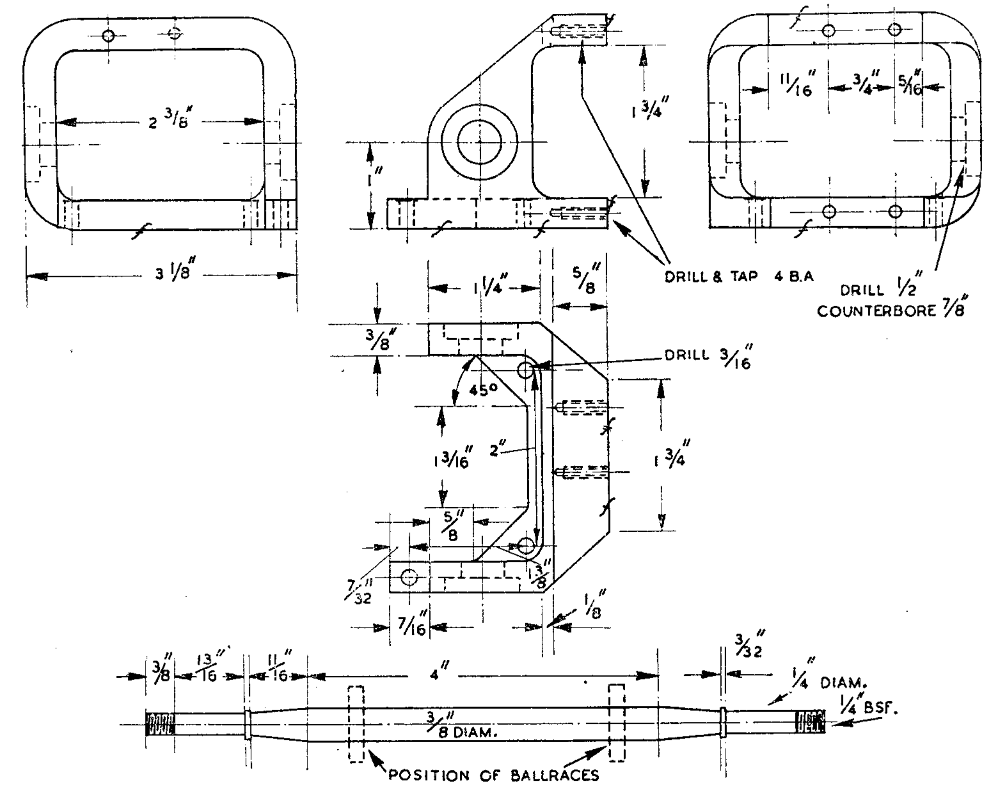


Fig. 1. *The Z.N. engine mounting bracket and back axle as modified to fit the " M.C.N." Grand Prix Special*

any size of car from 2.5-10 c.c., but, due to the tight fit of this particular unit in the very small overall width of the M.C.N. car, it has been necessary to design a special tank and this, too, might prove of interest, especially to readers who intend to install a similar engine.

Those of you who read *The Model Car News* will remember my comments when the design was introduced, that it was not my intention to spoon-feed the builder but rather, to put before him a proved design with an aerodynamically satisfactory body which would offer minimum resistance at high speeds. This I have done and it is now up to you to fit either your own or somebody's else's motor, of a type you consider most useful for your own requirements.

It has occurred to me, however, that those readers who are newcomers to the game, might

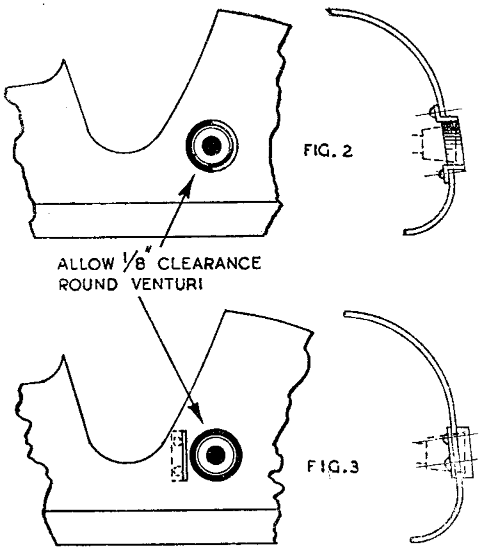
The reason for choosing the " Rowell 60 " as the means of propulsion was prompted by the very satisfactory results of tests carried out, and also, because I knew that if the car accommodated this very robustly constructed unit, it was immensely likely that it would accommodate any other of like capacity !

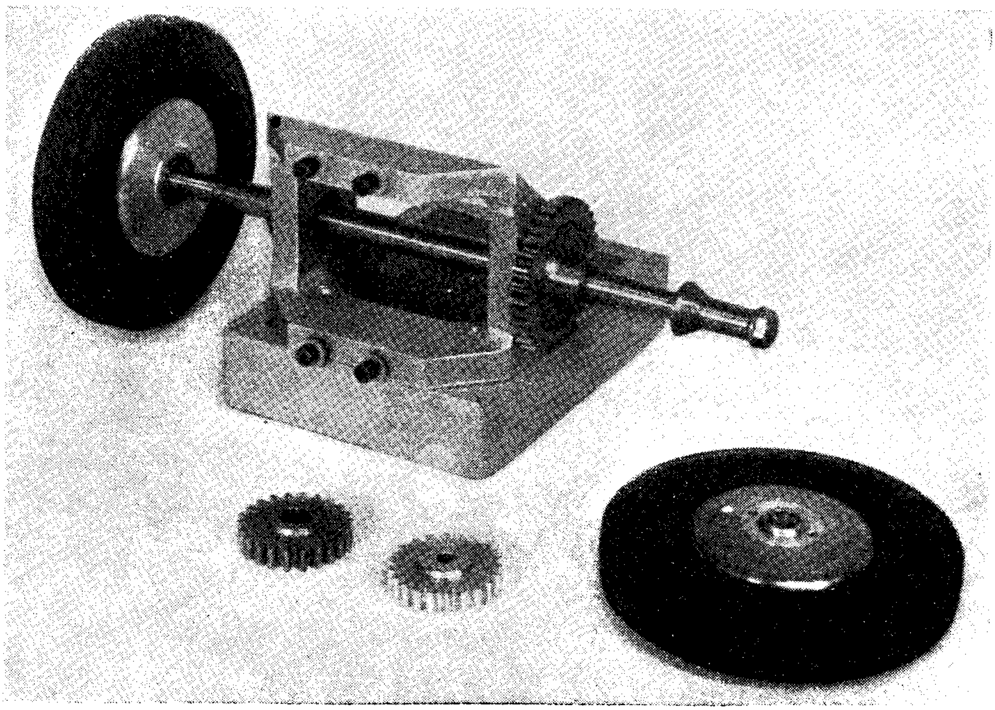
It would have been an easy matter to design an engine mounting bracket, but knowing that large numbers of readers of *The Model Car News* would find difficulty in casting and machining, a Z.N. type was employed and suitably modified as shown in Fig. 1.

You will note that the nearside rear holding-down lug has been removed. This was essential, due to the bottom radius and tail curve of the pan, coupled with the necessity of having the mounting as hard over as possible in order that the crankshaft end and flywheel should clear the interior offside of the body when fitted. This, in turn, necessitated the radiusing of the top nearside corner as shown, for a similar reason.

A great deal of adverse criticism was, at first, levelled on the mounting of a powerful racing engine with only three holding-down bolts. Well, entirely apart from the purely theoretical calculations which led me to decide that this number was ample, the model has now done much running on both track and bench without either engine, pan, or mounting showing the least sign of disapproval! Of course, for those of you who decide to make your own, a narrower bracket is the obvious answer, installed more or less on the centre-line.

Having bolted everything securely in position, it was found that the venturi fouled the nearside of the body just aft of the cockpit, thus preventing the body sitting squarely on the pan. This necessitated the cutting of a clearance hole, as shown in Fig. 2, and the fitting of an air scoop to ensure correct breathing. For the benefit of our younger or less experienced readers, it must be pointed out that vents or tubes with square ends





The Z.N. back axle assembly in its original form, including driving wheels and collets, spur gears and alloy magneto-drive wheel

that is, ends at 90 deg. to the cylindrical surface, placed at right-angles to the airflow, cause an extractor action ; hence the necessity for a scoop or, alternately, a bar or bridge which will cause the flow to break up and enter the venturi (Fig. 3). with the jet, fore and aft, to be successful.

No installation lugs are shown, as most readers will have their own ideas regarding this point, but on the prototype they consist simply of two strips soldered to the bottom, one fore and one aft, drilled to take 6 B.A. bolts and nuts. The filler should just protrude through the bottom nearside of the body and, with needle-valve "turned off," the tank is filled by turning the car on its off-side with the front end slightly elevated. Neoprene tubing is used to lead the nourishment to the horse.

I would be very pleased to hear from anyone making this model, and should there be any queries regarding constructional points, drop me a line and I shall endeavour to be of service.

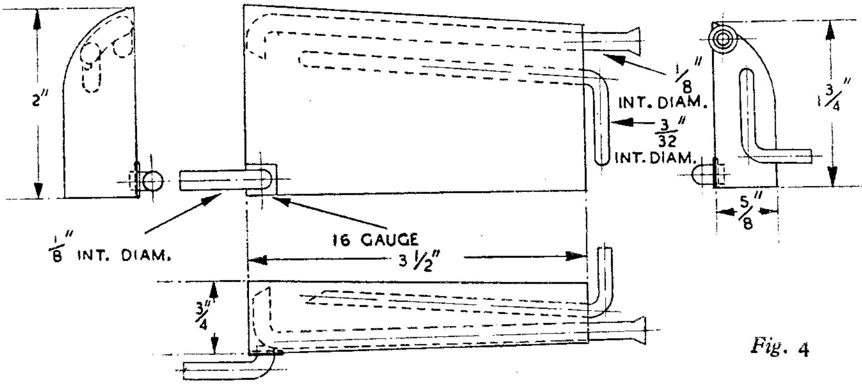
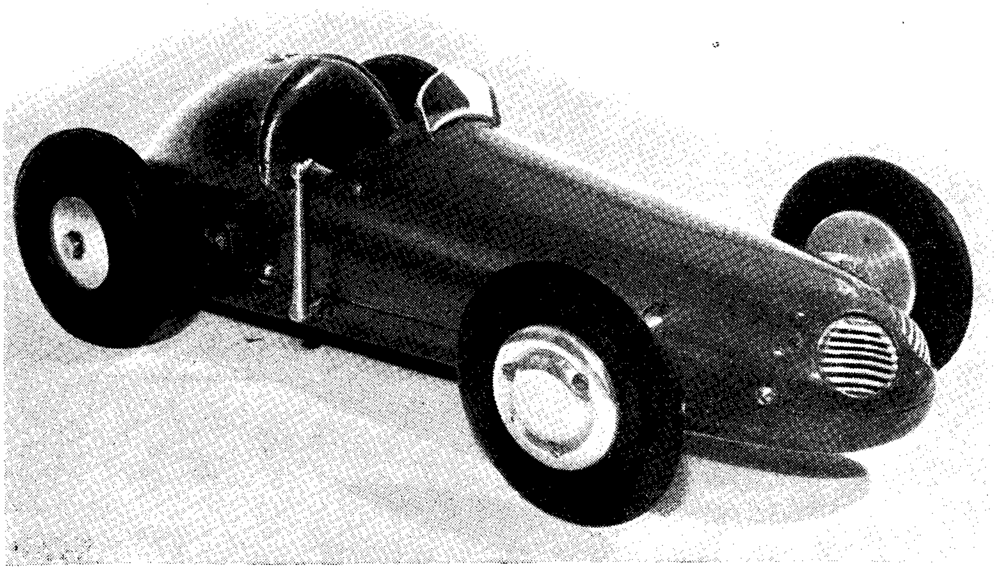


Fig. 4

The Fuel Tank

It is not anticipated that much difficulty will be experienced in the construction of the fuel tank, and for that very good reason I do not propose to write much on the subject. Let me endeavour to impress upon you, however, the necessity for keeping to the dimensions on the drawing, Fig. 4, if your engine is similarly mounted with the venturi flush with the nearside as described above. The delivery pipe simply *must* be kept as near as possible in line



The above excellent 2.5 c.c. version of the "M.C.N." G.P. Special shows the smooth, clean lines of this already popular model. Due to its diminutive size, the access panel and louvres have been omitted, and we don't know that we are very keen on the angle of the radiator grille ; but readers will agree that the builder, Mr. Hart, of the Edmonton Model Car Club deserves credit for a very fine job

IN THE WORKSHOP

by "Duplex"

58—Building the $\frac{3}{8}$ in. Cowell Drilling Machine from Castings

THE small MODEL ENGINEER drilling machine of $\frac{1}{4}$ in. capacity, designed by Mr. E. T. Westbury, was fully described in this journal some years ago. The design of this tool is particularly noteworthy in that the castings, which are apparently still obtainable, can be machined in a lathe of $3\frac{1}{2}$ in. centre height, and no shaping or planing operations are necessary.

There are, however, many workers who require an additional drilling machine of rather larger capacity to deal with the wide range of drilling operations commonly encountered in the small workshop. The Cowell machine of $\frac{3}{8}$ in. capacity was therefore, it would seem, introduced to meet this need. A good quality, accurate machine of this type is necessarily somewhat expensive, and to offset this the makers, in addition to finished machines, supply sets of machined castings which include blueprints and all the materials required for building the complete machine.

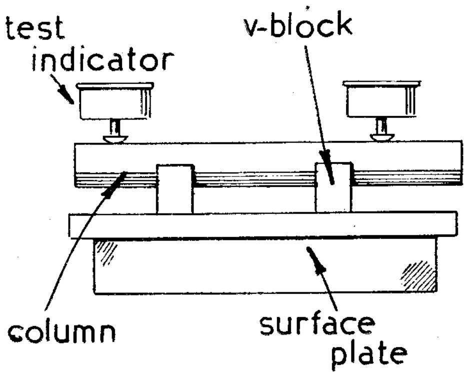


Fig. 1

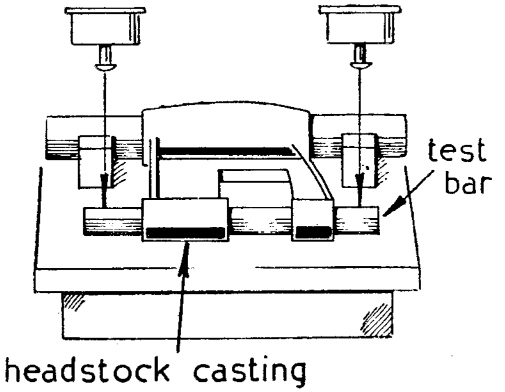


Fig. 2

The machining already done includes the planing of the flat surfaces of both the table and the base, and, besides this, the headstock is accurately bored to fit both the ground steel column and the finished quill supplied. The base casting and the bracket to carry the circular table, or the square table itself, are also bored to fit the column. In addition, the finished rack pinion and the spindle ball-thrust bearing are included in the set of parts. What machining remains to be done can quite well be carried out in a 3 in. or $3\frac{1}{2}$ in. lathe, leaving only some drilling and interesting hand-fitting work.

It is proposed, therefore, to give a description of making up these castings and materials with the aid of a small lathe, a drilling machine, and the usual hand-tools commonly found in the small workshop. At the outset, it should be made clear that no claim is made that the methods employed are necessarily the best or the quickest, but they were adopted primarily with a view to

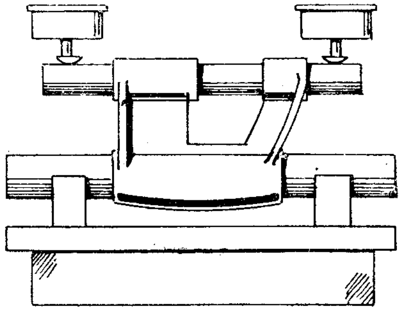


Fig. 3

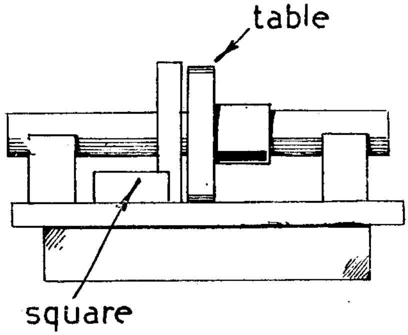


Fig. 4

obtaining an accurate result, notwithstanding the limited workshop equipment available.

Reference was made in a previous article to an addition to this machine whereby the speed range could be greatly increased, and, as low machine-speeds are so necessary for some operations and, in general, add to the usefulness of the

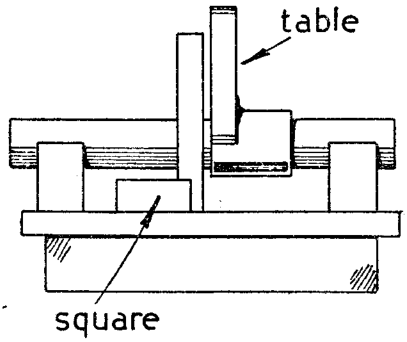


Fig. 5

machine, it has been decided to include a description of constructing this device, in an improved and more compact form, from the castings supplied.

Although the accuracy of the machining will have been checked before despatch of the castings, it will, doubtless, be found interesting to carry out a few simple tests before embarking on the construction of the machine. As shown in Fig. 1, the ground column is supported in two V-blocks resting on the surface plate, and the test indicator is applied to either end of the bar.

If necessary, a slip of paper is placed under one of the V-blocks to level the column exactly. The headstock casting is then clamped to the column, and a length of 1 in. diameter round bar is put in position in the quill housings.

The test indicator is next brought into contact with either end of this bar, as illustrated in Fig. 2; this will reveal any lack of parallelism between the column and the quill in the horizontal plane. If the bar is now brought into the upright position and the test indicator is applied as represented in Fig. 3, the parallelism of the components in the vertical plane can also be checked. Where the square pattern drilling table is fitted, its accuracy of alignment can be tested, as shown in Figs. 4 and 5, with the aid of an accurate try-square applied to the table surface in two directions at right-angles to one another. The application of all these tests showed that the workmanship was well within the limits of accuracy required in a machine of this type.

Most workers will, no doubt, prefer to start the constructional work by assembling the main parts of the machine, and then adding the smaller components and completing the detail work.

Accordingly, it was decided to begin by mounting the column in its base casting and fitting the work table. The machined headstock, when mounted in place, will complete the column assembly, leaving the headstock fittings and the driving gear to be finished at a later stage.

Fitting the Column to the Base Plate

Before fitting the column to the base, any work required to finish the base itself should be carried out. In this connection, opinions will vary, and some who care but little for mere appearance will be satisfied, as long as the working parts are properly finished ; others not only derive pleasure in contemplating and operating a machine highly finished in every respect, but are also fully prepared to spend much time on workmanship of this kind. Although the essential machining and hand-fitting operations will be described, reference will, therefore, also be made to work carried out almost entirely for the sake of appearance ; thus, leaving the builder to decide his own policy in the matter and be guided by his personal inclinations.

It was found that a one thousandth of an inch interference fit had been allowed for when machining the column bore in the base plate ; that is to say, the diameter of the ground steel column was exactly 1.250 in. and the hole in the baseplate 1.249 in. in diameter. The commercial method of assembling such parts, by means of a mandrel press, is not usually possible in the small workshop ; it was decided, therefore, to make the column a wringing fit in the base for part of its length and to complete the operation by screw pressure. It should be pointed out that in a case such as this it is inadvisable to attempt to drive the column into the base by hammering. The question arose of placing the parts in a substantial frame and applying the necessary pressure by means of a car jack, but this project was abandoned in favour of drilling the column axially and drawing it into place with a screw entered from below.

It a pedestal-mounted drilling machine had been available, the column could have been drilled quite easily, but, as this was not so, it was decided

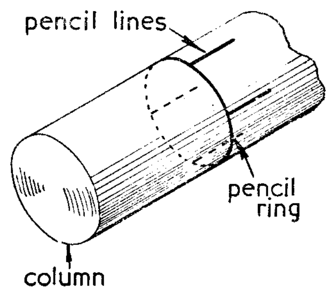


Fig. 7

that the work must in some way be done in the lathe rather than seek the help of the local engineering works.

Here, a further difficulty was met with, for the column is 20 in. long and the greatest length that could be accommodated even between the lathe centres was 16 in. However, the hole was drilled and tapped quite easily in the manner represented diagrammatically in Fig. 6. The lathe top-slide and tailstock were removed, and the fixed steady was mounted at the tailstock end of the bed. Next, the column was gripped in the self-centring chuck and the steady was

adjusted to support the overhanging end of the bar. To give support to the column in place of the chuck, the machine's own drilling table was fitted to the column, and, while the column was still gripped in the chuck and supported by the steady, the table was secured to the lathe saddle by means of an angle-plate. This arrangement results in the column being well supported at both ends, and, at the same time, traversing the saddle enables the column to be drawn through the steady and fed towards the drill mounted in the headstock chuck.

It then only remained to mount a centre drill in the chuck to form a drilling centre in the end of the column; this was followed by entering a pilot drill and the letter P tapping size drill. A $\frac{3}{8}$ in. B.S.F. tap was next gripped in the chuck, and the hole was in this way tapped to a depth of $\frac{3}{4}$ in. to receive the draw-screw. It was considered that, by using moderate force to tighten the draw-screw, the pressure exerted would hardly be sufficient to overcome the 1 thousandth inch of interference allowed, and, if the column refused to be drawn right home at the first attempt, a difficult situation would arise. Work of this nature is best tackled in a methodical manner, and, accordingly, the following plan was adopted in order slightly to reduce the diameter of the column and so ensure that it could be pressed into place. As represented in Fig. 7, a line was drawn with a grease pencil round the end of the column to indicate its full depth of entry into the base casting; four equally-spaced marks were then made on the circumference of this circle. With the column gripped between copper clams in the vice, a strip of fine, well-oiled emery cloth was applied to the end of the shaft opposite one of the lines; the column was then rotated to bring the second line uppermost, and the emery cloth was again applied using the same number of strokes. This procedure was repeated opposite the two remaining lines. It was then found that the base could be wrung on to the column for a distance of approximately $\frac{3}{16}$ in. As a micrometer measurement taken over the entering part of the shaft now showed that this was $\frac{1}{2}$ thousandth less in diameter than the remaining portion of the column, it was decided that the parts could be safely assembled.

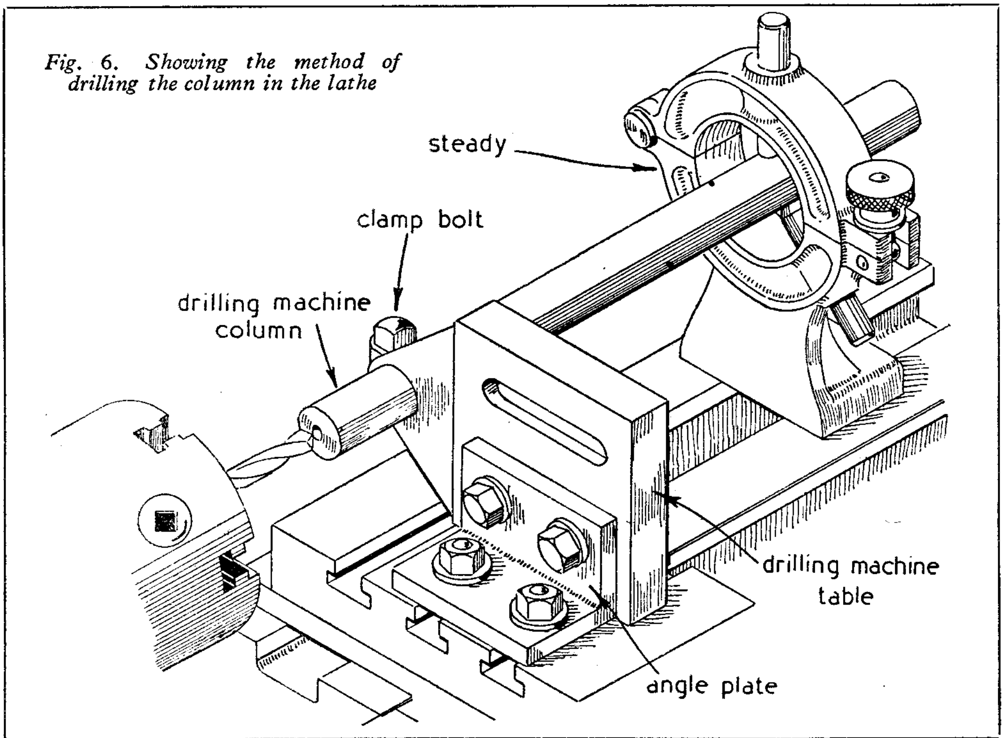


Fig. 6. Showing the method of drilling the column in the lathe

As illustrated in Fig. 8, a long stud was screwed firmly home in the shaft, and its threads, as well as the end of the column, were well oiled. Meanwhile, the base, which had been placed at the back of the anthracite stove, had reached a temperature that just allowed it to be comfortably handled. The base was then wrung on the end of the column, a draw plate $\frac{3}{8}$ in. in thickness was slipped on to the stud, and the nut was quickly tightened with a box spanner. Moderate force was required to seat the column, and, as the base cooled, a firm shrink fit was obtained.

The Table

The circular table is machined from the casting supplied, and it is, of course, essential to turn the spigot so that its axis lies truly at right-angles to the table surface.

After any irregularities have been removed

from the upper surface to allow the table to lie flat, it is bolted to the lathe faceplate over a piece of thick paper. The spigot is set to run truly and is then turned parallel for the whole of its length, but it must be left slightly larger than the finished diameter.

At this setting the lower surface of the rim

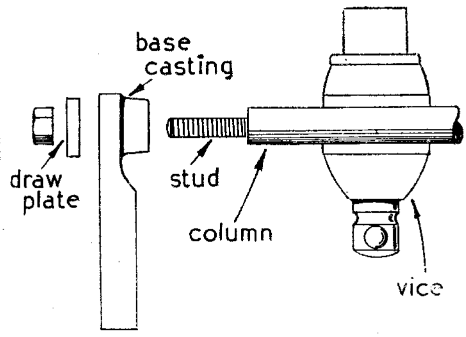


Fig. 8. *Pressing the base casting on to the column*

should be faced and the periphery turned for part of its length. The casting is now gripped by its spigot and centred in the four-jaw chuck; this will allow the table surface and the outer diameter to be finish turned. Finally, with the casting again bolted to the faceplate, the spigot is turned to a close fit in the bore formed in the table bracket. This method of machining the casting may seem unduly involved, but it makes allowance for any distortion arising as metal is removed, and it also ensures that the part is firmly gripped against machined surfaces for each finishing operation. To finish the table, the slots are marked-out and filed to shape, and, where necessary, the upper surface is scraped flat against a surface plate. The bracket for carrying the circular table requires to be drilled at either end for the clamp-bolts, in accordance with the blueprints.

Following this, the bolting faces are either spot-faced, or are filed flat with the aid of a toolmaker's narrow square inserted in the bore.

The square pattern table is carried directly on the column and no separate bracket is required. The front edge and the two sides of the table are marked-out and then squared up either by filing or by machining them in the shaping machine; this work can, however, be carried out by a milling or fly-cutting operation in the lathe, provided that the cross-slide travel is sufficient.

When the latter method is employed, the table is bolted by its machined surface to the boring table and packing blocks are used for height setting. Although machining will be much slower, it is advisable to use an easily sharpened fly-cutter for removing the scale from the casting, as a milling cutter would in these circumstances be quickly blunted. The flat surface of the table surrounding the column should be finished either by filing or machining, for paint in this situation will soon become damaged when clearing the machine of chips.

The bolting slots cast in the table are marked-out by standing the casting on edge on the surface plate, and scribing the dimension lines, as illustrated in Fig. 9; the table is then stood on its front edge to enable both slots to be marked-out to the same length. If a small washer is bolted to the table surface, the curved ends of the slots can in this way be neatly marked-out with a scriber. As the table is supplied with well-formed, cast-in slots, these can readily be filed to shape, but, if preferred, an end-milling operation can be employed if the casting can be mounted on an angle plate secured to the lathe saddle.

The final operation on the table is to scrape its surface flat with the aid of the surface plate, and then to chamfer the edges lightly with a fine file.

The Table Clamp-Bolts

The bracket carrying the circular pattern table is fitted with a clamp-bolt at either end, but the square table requires only a single bolt to secure it to the column. The bolt portion, made in accordance with the blueprint from the square material supplied, is a straightforward piece of work, but machining the ball-handled clamp-nuts for the circular table involves both a spherical turning and an angular drilling operation needing description.

A length of $\frac{3}{4}$ in. diameter round mild-steel,

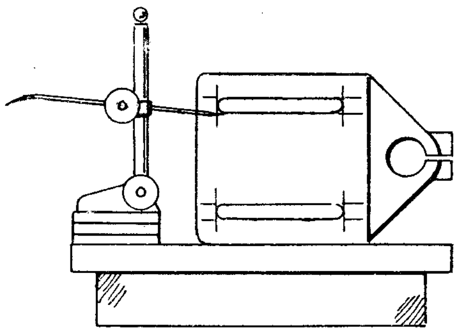


Fig. 9. *Marking-out the table bolting slots*

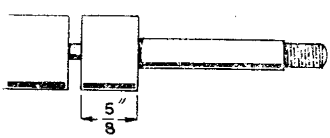


Fig. 10. *Machining the clamp handles*

gripped in the lathe chuck, is machined to the form shown in Fig. 10 and in conformity with the dimensions given in the blueprint.

After the head has been parted off to a length of $\frac{5}{8}$ in., the work is reversed in the chuck for turning the head to spherical form, either with the aid of a ball-turning attachment or by means of a form tool of the pattern illustrated in Fig. 11.

This tool, which has a cutting edge formed to a radius of $\frac{5}{16}$ in., is fitted with a long handle and is supported on the lathe hand-rest, so that it

can be guided with an even, controlled motion over the surface of the work until the head is machined to the finished shape. To drill the central hole at the specified angle of 20 deg., the head is firmly gripped between pieces of card in the machine vice, and by applying a protractor the handle is set to the correct angle. If the head is packed up so that it stands a few thousandths of an inch higher than the surface of the vice jaws, a few strokes with a fine file, held in contact with the vice jaws, will then form a circular area at the centre of the upper surface of the ball, as represented in Fig. 12. A centre-punch mark is next made at the centre of this circle to denote the drilling centre.

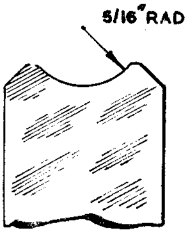
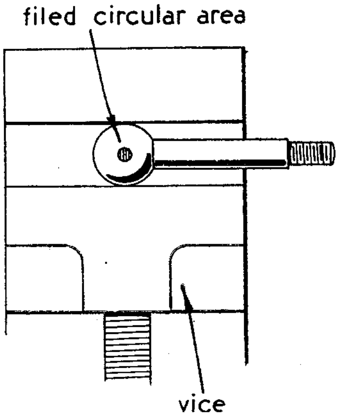


Fig. 11. Form tool for spherical turning



Right—Fig. 12. Marking the centre of the clamp handle head

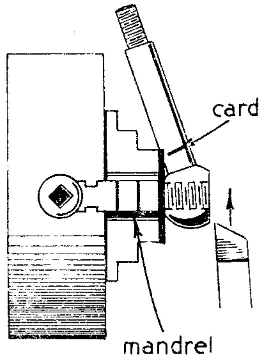


Fig. 13. Facing the head of the clamp handle

After the lever has been drilled and tapped, it is screwed on to a stub mandrel gripped in the lathe chuck. If the body of the mandrel is set back a little in the chuck, the head of the lever will be well supported by the ends of the chuck jaws; in addition, a card washer should be interposed to protect the work from damage and afford the head a better seating.

Where the square pattern table is fitted, the design of the table clamp-lever will require modification, for, unless the handle is fitted at a much more acute angle, it will not be possible to assemble the threaded nut portion on the clamp-bolt when the latter is in position. It should be noted that turning of the square-headed clamp-bolt is prevented by a shoulder formed on the headstock casting, and this construction allows the bolt to be set at any one of four stations, in order to bring the clamp handle into a convenient operating position.

The above difficulty was overcome by making the handle of the clamp-nut detachable, so that it could be screwed into place after the nut and the bolt had been assembled in the table lug. The working drawings of the components are given in Fig. 14.

The bolt (*A*) projects $\frac{3}{8}$ in. from the face of

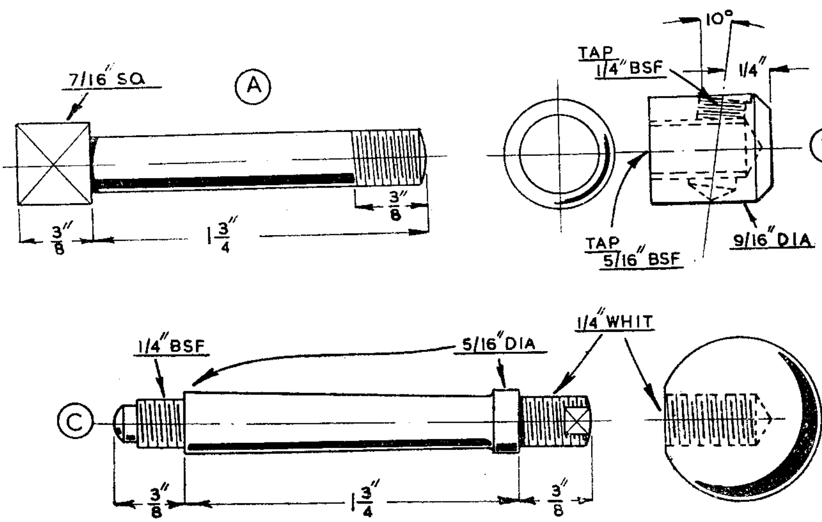


Fig. 14

the casting and is fitted with a washer $\frac{1}{16}$ in. in thickness. The nut (*B*), made from a length of $\frac{5}{8}$ in. diameter round mild-steel, is cross-drilled and tapped $\frac{1}{4}$ in. B.S.F. to receive the handle (*C*). The cross-drilling operation is best carried out before the rest of the handle is machined.

A cross centre-line is marked-out on the end of the rod and is continued along the upper surface of the material; the drilling centre for the cross-hole is marked-out on this line with the jenny calipers and then punch marked. The work is next gripped in the machine vice with the diameter line set vertically with the aid of a square, and by applying a protractor the rod itself is adjusted to an angle of 10 deg. A centre drill, having a body of $\frac{1}{8}$ in. diameter, is now entered up to its full diameter, and this is followed by a $\frac{1}{8}$ in. drill fed in to the full depth of the hole. A pin drill with a $\frac{1}{8}$ in. pilot and a body diameter of $\frac{5}{16}$ in. is next employed to form a recess to receive the handle, and the drill hole itself is enlarged with a No. 4 drill and tapped $\frac{1}{4}$ in. B.S.F.

The work is now mounted in the lathe to enable the hole for the clamp-bolt to be drilled and tapped from the tailstock; after which, the outer diameter is turned to size and the nut is parted off to length. It then remains to finish the part by reversing it in the chuck and facing and chamfering its other end.

There should be no difficulty in machining the handle, for, after the two ends have been centre drilled, turned to size and threaded, the part is mounted between the lathe centres and the tapered portion is turned by setting over the top slide for approximately 1 deg. to give a good appearance to the work.

Two flats are filed on the upper end of the handle so that this component can be screwed firmly home in its seating after the nut itself has been assembled on the table clamp-bolt.

(*To be continued*)

Storing Small Drills, Taps, Dies and Reamers

A VERY satisfactory way of storing drills up to $\frac{1}{4}$ in., including number and metric sizes, is to make use of small envelopes of the wage-packet type, approximate size 4 in. $\times$ $2\frac{5}{8}$ in.

An envelope is used for each size, and marked as shown in Fig. 1.

In a similar manner, reamers, small taps and

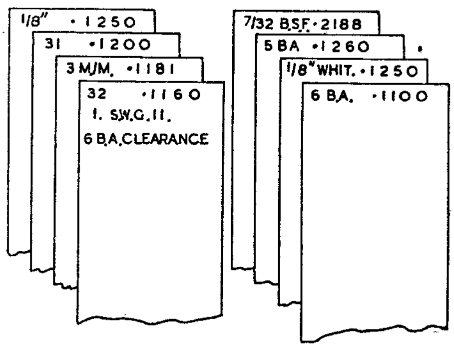


Fig. 1

in one envelope, whereas the drill stand takes only one of each size. An envelope containing a normal drill, a short one, and drills ground at various angles, including a flat bottoming drill, is most useful.

Generally speaking, too, a drill stand accommodates only *either* fraction sizes or number drills. By making use of envelopes, all drill sizes you have can be seen at a glance in decimal sizes,

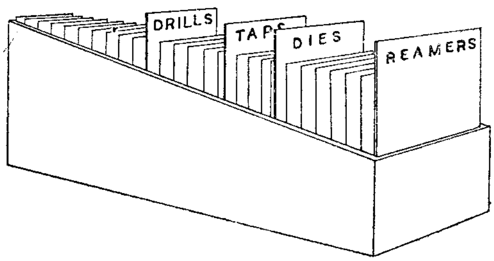


Fig. 2

dies in sizes up to and including $\frac{1}{4}$ in., can be stored. B.S.F., Whitworth and B.A. threads can all be catered for, by using their decimal sizes to file them in the envelope storage box.

A box is made as shown in Fig. 2 to store the whole series of envelopes, grouped as shown.

The advantage of storing drills in this manner in preference to the usual drill stand, is that a number of drills of the same size can be stored

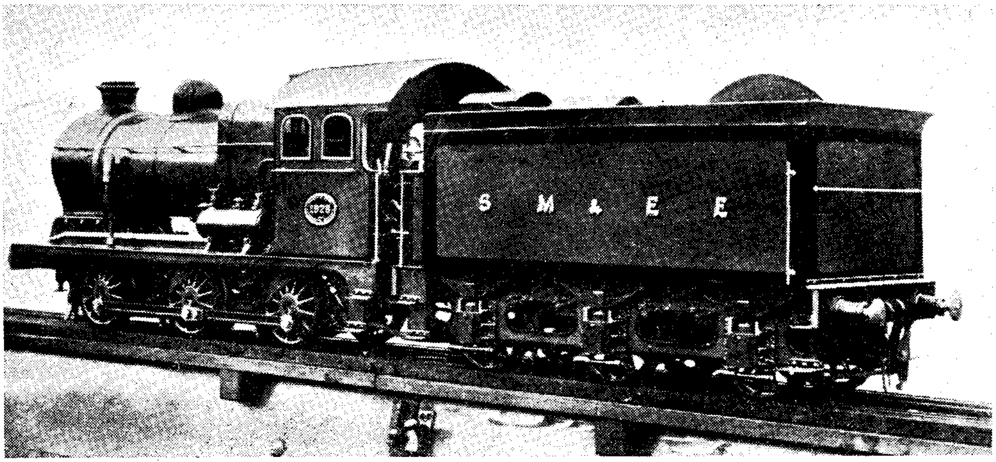
the largest at the back and the smallest to the front. Other useful information can be marked on the envelopes as shown in Fig. 1.

Drills, reamers, taps and dies should be cleaned before replacing them in the envelopes after use. The envelopes will last longer and so will the tools if one works cleanly and tidily and the drills are unlikely to be attacked by rust when stored in this way.—J. PITCHFORD.

Improvements and Innovations

No. 8—1928 to 1950

by "1121"



The 1-in. scale locomotive constructed by members of The Society of Model and Experimental Engineers

DURING the 1949 MODEL ENGINEER Exhibition somebody made the remark that the side-rods on the society's engine were getting a bit sloppy, and this reminded us that that exhibition marked her 21st birthday, and prompted us to try to calculate very roughly the amount of work she had done up to that time.

For a start, she has been the chief performer at fourteen "Model Engineer" exhibitions, and fifteen Model Railway Club exhibitions, but this is only a start. In addition, she has run at some 150 fetes, sports days, garden parties, local exhibitions, etc., as well as doing a lot of private and club work. At a very rough estimate she cannot have run less than 1,500 actual miles, and must have hauled at least 250,000 passengers.

In the days when this locomotive was built, an exhibition was a leisurely affair. We sat there waiting for passengers, now and then trundling up and down the track blowing the whistle in the hope of attracting a customer. At slack times like this, there was plenty of opportunity for letting people who wanted to "have a drive" try their hand. The society required an engine which was simple to drive, and which could be handled safely by any person to whom would be applied the technical classification of "B.F." In those days an injector, for example, was a temperamental piece of apparatus with which none but the most experienced could be left alone with safety, and so the engine was fitted with a little donkey-pump which was entirely fool-proof. A little while ago this pump began to show signs of wearing out, which is not surprising considering that it must have pumped something like 1,500 gallons of water during its lifetime. Several times it was kept going by various forms of bodging, fiddling, titivating, etc., until it was finally decided that if it was going to work again it would at best need to be completely overhauled, which would include reboring and new pistons, and more likely want replacing by a new pump. The "back-room boys," whose job it is to look after the engine (we refuse to try to calcuate the number of hours this has involved in the last 21 years), were unable to spare the time to make a new pump, or even to give the old one the necessary overhaul, and it was suggested that the simplest thing would be to rig up an injector on the ends of the steam, water and delivery pipes left when removing the pump.

The reasons for fitting the pump in the first place had by now largely disappeared. Traffic is so continuous and heavy at exhibitions nowadays that we are only concerned with ploughing our way through the queue just as hard as we can go, and it is just not possible to allow any but the most experienced drivers to take complete charge of the traffic under these conditions. We are far more concerned now, not with merely letting any "B.F." get up and amuse himself, but, on the rare opportunities that present themselves, with training him not to be a "B.F.," but a useful driver who can take his turn at working serious traffic. In any case the modern injector is just about as reliable as a pump, and our friend Mr. Linden presented the old engine with

one of his in a fine spirit of "*pro bono loco.*" This has fitted in quite neatly where the old pump was, the cock that used to be the pump by-pass to the tender now becoming the water-supply valve to the injector.

When the engine was built, a certain number of "improvements and innovations" were incorporated. Apart from easy driving, she was designed particularly with a view to easy dismantling—her cylinders and motion work, for example, are mounted on a pair of sub-frames which slip up in between the mainframes, so that all this can be fiddled with out in the open, and popped into the engine as a complete unit.

She has a two-element superheater, and by undoing two union nuts easily get-at-able through the smokebox door, each element can be withdrawn from its flue for attention if necessary, while two short "by-passing" pipes can be fitted in lieu so that she can be worked "wet" in the meantime. The operation of withdrawing the superheater, in fact, is so simple and quick that it has become part of a periodic flue-cleaning process. In the ordinary way, the business of cleaning flues with a superheater in place can only be accomplished by means of a comparatively thin rod or an air-dart, both of which merely poke a tunnel through the blockage of soot, and follow the same path every time. Just how much "superheating" is achieved with an element through a flue, packed solid with soot with the exception of two small holes, is open to conjecture.

Another unusual feature of this engine concerns the brake gear, which has a dual-control, being operable either manually or by steam. The steam valve is one of Mr. W. B. Hart's special "graduating" type, which have been described in these pages, enabling a range of pressure to be applied in the steam cylinder, as distinct from the "on or off" behaviour of the ordinary valve. For all this, however, the manual lever, with its ratchet like a car brake, is extremely handy for holding the engine still while tubes are being swept, etc. The brakes, whether operated manually or by the steam valve, work through to the tender brakes as well by means of simple push-buttons, this feature having been incorporated on several other engines having associations with the same stable, with particular effect.

Cylinder lubrication is by the hydrostatic principle, which, while being effective, has been improved out of all recognition on one of our other engines (Mr. A. J. Maxwell's "Armstrong" 0-6-0 goods), by the installation of sight-feed apparatus as described by Mr. F. Cottam in THE MODEL ENGINEER some time ago. "1928's" lubrication can be adjusted by means of a needle-valve, but it is difficult to know when it is adjusted right. A "gulp" of oil to "make sure" is wasteful, as we have discovered since we had a sight-feed on Mr. Maxwell's engine (the oil lasts three times as long when used efficiently), apart from the distinct disadvantage of occasionally frying the driver and passengers. When we first discussed the question of fitting the sight-feed to "1928," Mr. Maxwell promptly announced that if it was successful he would have one on his. As things turned out, however, Mr. Maxwell got his in first, and our experience with it since has shown the gadget to be so worth while that we will fit one to our "old lady" just as soon as we can.

"1928" has boasted a steam-chest pressure-gauge for quite a long time now, but as far as we know, nobody has yet observed its behaviour at all systematically. With the time rapidly approaching, however, when serious research can be organised on the S.M.E.E. locomotive test stand, we have no doubt that this fitting will come in for a share of attention when we can operate the engine, under varying conditions of speed and load, without the necessity of keeping our balance on a truck or watching for the track dead-end.

We will finish this little dissertation by mentioning an "innovation" which occurs in the tender tank, consisting of a multiplicity of floats and levers by means of which a miniature indication of the water-level is shown on a small indicator mounted on the top of the tank, and an "improvement" by means of which a small puff of steam is emitted by the dummy whistle in front of the cab, when the appropriate noise is produced by the real one under the foot-plating!

A Unique Locomotive Class Extinct

The recent withdrawal of British Railways (Western Region) 2-6-0 locomotive No. 2667 has rendered extinct a unique class. These engines were known as the "Aberdares," due to the fact that they were originally built for working the heavy South Wales coal traffic, especially from Aberdare where a large number were actually stationed.

We claim them as unique because nowhere else in the world could anything like them, or even remotely resembling them, be found. The "Aberdares" were heavily-built and rather clumsy-looking double-framed 2-6-0 type engines with inside cylinders and outside cranks; yet they were, somehow, lovable and it seems that they inspired respect and affection just as often as they aroused ridicule and criticism. We have never seen one modelled in any larger scale than 10-mm. to 1 ft., and in this size the only one we know was built many years ago by Mr. A. W. Marchant, of the S.M.E.E. We should have thought that these very distinctive locomotives might have appealed to more of the many people who so often write to us for suggestions for out-of-the-ordinary locomotive subjects. For heavy work on 5-in. or larger, gauge, where curves are not too sharp, an "Aberdare," properly designed and built, would be hard to beat.

Queries and Replies

Enquiries from readers, either on technical matters directly connected with model engineering, or referring to supplies or trade services, are dealt with in this department. Each letter must be accompanied by a stamped, addressed envelope, and addressed : " Queries Dept.," THE MODEL ENGINEER, 23, Great Queen Street, London, W.C.2.

Queries of a practical character, within the scope of this journal, and capable of being dealt with in a brief reply, will be answered free of charge.

More involved technical queries, requiring special investigation or research, will be dealt with according to their general interest to readers, possibly by a short explanatory article in an early issue. In some cases, the letters may be published, inviting the assistance of other readers.

Where the technical information required involves the services of an outside specialist or consultant, a fee may be charged depending upon the time and trouble involved. The amount estimated will be quoted before dealing with the query.

Only one general subject can be dealt with in a single query ; but subdivision of its details into not more than five separate questions is permissible. In no case can purely hypothetical queries, such as examination questions, be considered as within the scope of this service.

No. 9756.—Tethering Hydroplanes
G.R. (Farnborough)

Q.—I am building a hydroplane, and, not having had much experience with same, am not quite sure which side the tethering line should be fixed. Is the direction of propeller rotation the deciding factor ? The propeller on my hydroplane rotates anti-clockwise. Could you tell me the correct side to fix the line ?

R.—The usual arrangement for tethering hydroplanes is to locate the line attachment in such a way that the torque reaction of the propeller tends to turn the boat outwards, that is, away from the centre of the course, and therefore keep the line taut. In your case, the anti-clockwise rotation of the propeller is, we presume, taken looking from the after end of the boat, and if so, it will generally be found best to fix the tethering bridle on the starboard or right-hand side of the boat, and run the boat in a clockwise direction round the pole. It is, however, sometimes found that the boats run better in the opposite direction and some experiments will often be found desirable to determine this point.

No. 9762—Intermittent Motion
W.B. (Upton-on-Severn)

Q.—Could you tell me how I can make the Powers pin-wheel movement for a 16 mm. projector ? I am using an 8-tooth sprocket for feed and take-up, and should like to know what number of teeth there should be on the intermittent movement.

R.—The Powers pin-wheel intermittent movement is a variation of the Maltese cross principle, but we regret that at present, we have no detailed information on this particular mechanism. We may mention that, in common with the Maltese cross movement, it demands exceptional accuracy in construction in order to obtain a perfectly equal shift movement for each frame, and for this reason it is a much less suitable mechanism for the amateur constructor to produce than the more common claw mechanism used in sub-standard cinema movements.

The number of teeth required for the intermittent sprocket of a Powers movement would depend on the details of design in respect of the number of shifts in one revolution of the intermittent sprocket. As there is only one tooth per frame in sub-standard films, the number of teeth would be equal to the number of shifts per revolution, and this constitutes another disadvantage of the intermittent sprocket type of movement, as it is not possible to use the same design of movement as is used on the 35 mm. projectors.

No. 9757.—Adjustment for the Atom Type R Carburettor.
J.W.B. (Wantage)

Q.—I have just finished a 30-c.c. two-stroke designed for an " A " class hydroplane. It has an Atom R type carburettor and I am afraid its adjustment has me stumped. Could you please give me any information on this ?

R.—The best way to adjust the Atom type R carburettor is to run the engine under normal load on full throttle and adjust the jet to give the best possible speed and power. The throttle is now gradually closed and if any signs of weakening of the mixture are perceptible, it indicates that the air bleed grooves in the main jet are not sufficiently large. Enriching of the mixture at lower throttle openings indicates that they are too large. At about one-quarter throttle, the air velocity through the choke will probably be too low for the main jet to function properly, and at this point the pilot or slow-running jet begins to come in ; this jet should be adjusted with the smallest possible throttle opening, and in this position, it should be set slightly on the rich side.

For adapting the carburettor to volume requirements on different sized engines, it is advisable to have one or two spare diffuser nipples. The bore of the largest nipple used should never be greater than the diameter at the small end of the taper bore in the body. An article on the Atom type R carburettor appeared in the issues of THE MODEL ENGINEER dated July 27th, August 3rd, and August 10th, 1939.

No. 9755.—Speed Boat Engines
G.O.C. (Bickley)

Q.—During a recent conversation the point arose that 30-c.c. speed boats fitted with four-stroke engines usually seem to show more speed than those of the same class but fitted with two-strokes, while those of smaller classes seem to shine with two-strokes. It would appear that over about 10-c.c. the four-stroke produces more power. If this is so, is it due to the fact that in the small sizes, the valve-gear absorbs too much power, or is it that in the larger two-strokes the scavenging is not so good as in a four-stroke?

R.—It would be very difficult to make any definite pronouncement regarding the comparative merits of small two-stroke and four-stroke engines, as so little really accurate test data is, as yet, available about either. One point which may possibly affect the issue is that most of the 30-c.c. speed boat engines at present in existence are of the four-stroke type, because these have always been the more popular from the constructor's point of view, whereas the smaller engines, which are sometimes of the commercially produced type or in other cases have been based on commercial designs, are almost exclusively the two-stroke type. It is, however, a fact that the main asset of the two-stroke is its high mechanical efficiency, as the volumetric efficiency and mean effective pressure in the cylinder are usually quite low, particularly at the higher speeds. The four-stroke engine has a higher volumetric efficiency and mean effective pressure, but the power absorbed by valve-gear, as you suggest, is considerable, and tends to increase proportionately as the size of the engine is reduced. Another point is that at really high speeds, say 10,000 r.p.m. and over, it is extremely difficult to ensure that the valves are operated in accordance with the designed timing diagram, and cam design for high speed becomes an extremely critical feature in successful working. We have never yet seen a small four-stroke engine in which correct valve action could be guaranteed at speeds much above 12,000 r.p.m., but we may add that this speed is rarely attained under load conditions, even in very fast boats.

No. 8032.—Railway Paints

Q.—Several readers, commenting upon our reply to Query No. 9751 concerning "Stroudley's Improved Engine Green," raise the question as to why the original formula should now be impossible to discover; in effect, they write: This is disappointing news to people who desire to reproduce colours and styles of painting correctly. Why should the information have been lost?

R.—There is probably more than one reason; but the principal one may be due to the fact that railway companies were not paint manufacturers. When colours and styles of painting of rolling stock had been decided by boards of directors and chief mechanical engineers, contracts were let to paint manufacturers for the supply of suitable paints.

Sometimes, it happened that more than one manufacturer supplied paints to one railway company, and the effect was apt to be noted in, say, two freshly-painted locomotives which could be seen to be not quite the same colour. In the days when "Stroudley's Improved Engine Green" was in use on the old London, Brighton & South Coast Railway, slight dissimilarities of the kind just mentioned were apparent. It is now well over forty years since the Stroudley colour was used, and possibly another forty since the particulars were passed to the manufacturers. In such circumstances, all records of the original formula can easily have become lost.

No. 9783.—Suitable Steels for Steam Engine
J.S. (Blackburn)

Q.—I am having some difficulty in the choice of materials for the $\frac{3}{4}$ in. bore and stroke single-acting steam engine which I have designed. Surely, it is difficult to avoid rusting in the cylinders when they and the pistons are made from cast-iron, and I would like to make both out of bronze or from some similar material, even if the engine life is shortened by its use. Could you please tell me the most suitable material to use for the piston, cylinder, cylinder cover and connecting-rod, apart from cast-iron? I would also like to know where one can obtain good hard bronze. Would you explain the difference between brass, bronze and gunmetal, and between stainless and silver-steels and their respective uses.

R.—It is possible to use hard gunmetal or bronze for the cylinder of a steam engine, but where superheated steam at high pressure is employed, the mechanical properties of this particular material are not really good enough for long sustained running at high speed. In spite of the fact that cast-iron is undoubtedly subject to corrosion to some extent, it is by far the most suitable material, both for cylinders and pistons of all engines which have to withstand heavy duty, and in practice it is possible to keep the parts in contact with steam from rusting if they are kept well lubricated. With regard to metal specifications, brass is an alloy of copper and zinc. Both bronze and gunmetal contain a proportion of tin, and in some cases certain other elements, which renders them considerably harder than brass, and also produces a lower frictional co-efficient so that they are more suitable for bearings. The term "gunmetal" is taken to refer to a type of bronze which was formerly used for casting cannon, but nowadays it is a very indefinite term, and refers usually to the softer forms of bronze, intermediate between hard bronze and brass. Stainless-steel is an alloy steel containing proportions of nickel and chrome which make it resistant to corrosion, and it is, therefore, suitable in cases where ordinary steel would be more liable to corrosion. Silver-steel is a high-quality carbon tool steel (incidentally, it contains no silver) and is used in cases where a greater hardness than can be obtained with mild-steel is necessary, particularly for cutting-tools, as it can be hardened and tempered like ordinary tool steels, whereas mild-steel cannot be hardened, except by a case-hardening process which affects only the outer layers of the steel.

PRACTICAL LETTERS

An American Model Steamboat

DEAR SIR,—It was the issue of July 28th which prompted me to write this letter, coupled with the fact that I would like to say THE MODEL ENGINEER has given me many hours of pleasure, and here is my vote of thanks for your excellent work.

The picture of one of my models, reproduced here, is perhaps the most interesting, because I think it has the more unusual history. This model is not exactly to scale, in fact it might be called a "toy"; but it is a reliable working boat. The *Buckeye State* was built just after the war ended, from the scrap of wrecked airplanes, ammo boxes, and other parts found on an airfield. I built this model overseas, then shipped it home. The entire boat is of sheet metal; the liners are made from ammunition boxes, the original boiler from a P-40 engine mount, the cylinder of the engine was a piece of a structural member of a P-38, the piston was a .50 cal. case and the flywheel, the base of a 37 mm. case. The entire boat, which includes the power plant, was constructed with only a few tools, an electric drill, a file, a pair of tin-snips, a soldering iron, and a welding torch.

Since I now have an engine-driven lathe, I have constructed a new plant with more precision which is perhaps more reliable. She now has a copper boiler, of the Yarrow type; 1 in. × 1 in. single-acting engine, a 3 in. × 3 in. screw, and is fitted with electric running lights, whistle and engine-room bell. The safety-valve is set to pop at 80 lb. which can be reached in four and one-half minutes, but the boat will perform very well at only 30 lb. pressure. The steam pressure is easily regulated by the air pressure on the fuel tank. The burner is, I believe, of an English design, called the Carson (I may be wrong on this) and burns white gasoline. The duration of the water supply is approximately 50 min. The length of the model is 34 in., and the loaded weight about 40 lb.

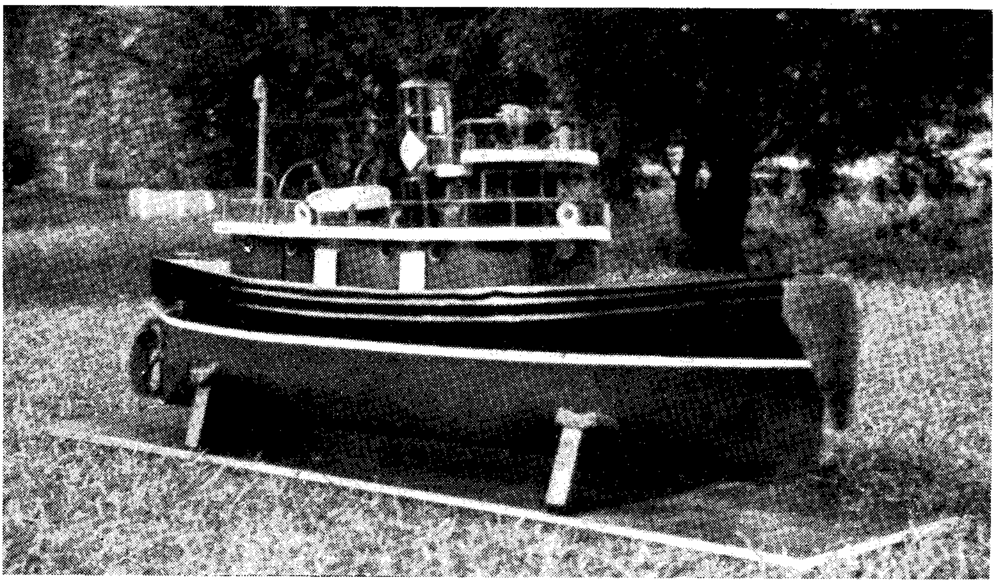
At the present time I am engaged in making a model of a river stern wheeler, this type of craft being peculiar to the western rivers of the United States (I believe this to be correct). The prototype is the towboat Stmr. *Omar*, with tandem-compound engines 16 in. and 32 in. × 8 ft. stroke; 1,100 h.p. My model has only simple engines; the complicated valve-gear and 16 valves seemed to me to be too unreliable for a working model. My craft is $46\frac{1}{2}$ in. long, and the engines are $\frac{1}{2}$ in. × $1\frac{7}{8}$ in. The hull and the power plant are completed, and it has taken me just about a year to get this far. Incidentally, a river towboat actually is a pushboat, pushing the barges ahead of the boat rather than towing astern. The *Omar* has the record for the largest tow on the Ohio River, the tonnage being upward of 27,000, and 28 barges totalling 1,100 ft. in length. This type of boat is of very shallow draught, drawing only 5 ft. fully loaded. Unfortunately, for the lovers of these graceful steamboats, the sternwheeler is gradually being replaced by screw-driven diesel power.

THE MODEL ENGINEER has been very helpful in the articles by Mr. Westbury. It is indeed refreshing to read articles concerning steampower, because here in the United States such models are definitely in the minority—I could say they are quite rare.

Again I would like to say, "Thanks for the good work."

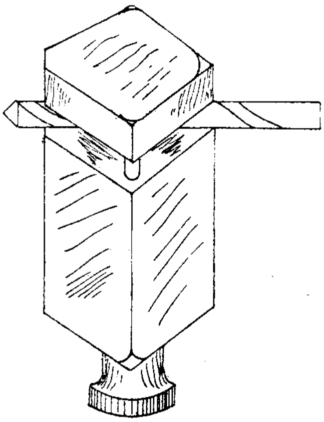
Yours faithfully,

Cincinnati, Ohio. ROBERT W. MAYNARD.



Sharpening Twist Drills

DEAR SIR,—I think that I can to a certain extent help your Californian correspondent, mentioned in "Smoke Rings" for January 19th. In THE MODEL ENGINEER for October 25th, 1934, "Inchometer" described a grinding holder for small drills, designed by Mr. George Parsons, of Redhill, Surrey. I made one soon after the notes



Grinding holder for very small drills. (1) *Diagonal section to show central hole.* (2) *Top view of block showing grooves and position of holes.* (3) *Cap with steady pins.* (4) *Top view of cap.* (5) *Shape of grooves.* (6) *Crosshole section through central pin.* (7) *Tightening nut, may be of brass*

appeared and have found it so invaluable ever since that I have often thought of bringing this useful device to the notice of new readers. I think the drawings, which are copied from the article in question will make its construction pretty clear. I made mine from ¾ in. square steel. The body and the cap have a small piece of the corner removed for the whole length on one side. The cap (3) I turned from the solid, but before doing this, I drilled the ⅛ in. clearing hole and carried the turning up till the hole was just cleared. There is a diagonal groove in the body, running from the cut-away corner. This I milled by using a countersink drill. There are two steady pins to keep the cap (3) in alignment with the body. To use it, push the drill through the hole in the cap until it projects a little from the cut-away corner. Twist it round until it is seen to be at the correct angle for sharpening, clamp it with nut (7). Lay the block on the oilstone, and rub it up and down on two sides, and with very little trouble each facet may be equally sharpened. The only difficulty is in putting in the drill on the right slew, but a little experience and thought will soon put one right. Very occasionally one comes across a defective drill. I sharpened a 5/64 in. h.s. drill recently five times without result, and then by testing with a file, I found it to be as soft as mild-steel.

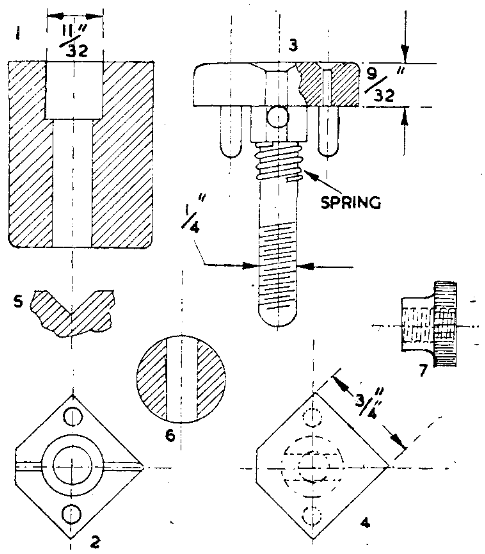
For drills from ⅛ in. downwards this little device would be hard to beat for effectiveness.

Yours faithfully,

Swanage. H. E. RENDALL.

Steam Locomotive Development

DEAR SIR,—While sharing the somewhat pessimistic views as to the present trend in prime-mover development, may I add a rider? It all boils down to a question of £.s.d. As soon as the steam locomotive proves unable, by and large, to compete with its rivals in the field as a revenue-producing unit, then out it must and



will go. It is the auditor and not the C.M.E. who will determine its ultimate fate.

The real danger, as I see it, is that steam locomotive designers being under ever-increasing pressure from this quarter will tend more and more to take the line of least resistance, which will, in turn, have the effect of convincing the powers-that-be (who are interested only in profit and loss) that there is no future in the steam locomotive as such. No more technical experimenting will be done with it on the assumption that no more experimenting *can* be done profitably. And the operative word *is* "profitably." To the heads of the Railway Executive and to the directors and shareholders of locomotive building firms very naturally it means one thing, whereas to us amateurs with the cause of steam locomotive efficiency at heart it means something quite different.

What interests me, however, is this: are your "expert" contributors satisfied that the optimum point of efficiency in steam locomotive design (orthodox or heterodox) *has* been reached? I use the term "efficiency" in its broadest possible sense, economic not excluded.

Before giving my own views may I draw on a little analogy within the personal experience of many readers of THE MODEL ENGINEER? Thirty years or so ago a 3½-in. gauge coal-fired engine was considered a bit of a marvel if she managed to shift her owner a few yards down the garden track. Gauge 2½-in. was regarded in commercial and amateur circles as being suitable for little

more than " scenic " purposes. Nobody expected a " ½-in. scale model " to do more than haul a few tin coaches, and then only at a colossal expenditure of methylated spirit, water, and wasted steam. Where are we *now* ? Certainly not where we were then !

The bald truth is that the astonishing progress in " efficiency " (again in its broadest sense) that has been registered since those days is in very large measure due to one man's work. I need hardly mention his name. But we do not have to see eye to eye with " L.B.S.C." in everything to recognise *facts* that stare us in the face.

I myself once had the privilege of handling the original " Fayette." If somebody had previously told me that a coal-fired engine in so tiny a gauge existed with a tractive effort like that of a baby elephant and a boiler capable of supplying so much surplus " gas " for the job of pulling my weight that one hardly knew how to get rid of it, I should have put him along with Baron Munchausen and his ilk right away !

But " Fayette " herself is now quite a back number. I haven't the slightest doubt that, given the incentive, our friend could build a 4-6-2 in the same 2½-in. gauge that would not only put her performance in the shade but—what is more significant—*would show a decrease in fuel and water consumption* for a greater tractive effort.

What is the moral of this ? Does it not provide a lesson for the " full-size " steam locomotive designer and ultimately for the business men in high places ? Surely so. Can the revolution symbolised by " Fayette " be repeated in gauge 4 ft. 8½ in. ? I venture to prophesy that it can and will ! But the first thing is to find a " full-size " Curly, and the next to let him get on with the job . . . if he hasn't started in on it already, that is. For there *are* rumours afoot, of course !

Yours faithfully,

Birmingham. D. B. VERNE.

CLUB ANNOUNCEMENTS

The Society of Model and Experimental Engineers

On Thursday, March 16th, at Caxton Hall, Westminster, at 7 p.m., Mr. E. T. Westbury will give a lecture on " Lathe Attachments, how to make and use them." This is a subject which will be of interest to all members, whatever particular branch of work they follow. Visitors from other societies will be particularly welcome, and should apply for cards of admission to the hon. secretary.

Progress on the new headquarters continues, and members should watch this column for an announcement of the date when the opening ceremony will take place.

The hon. secretary apologises for having inadvertently given the time of the February 18th meeting as 7 p.m., instead of 2.30 p.m.

Hon. Secretary : A. B. STORRAR, 67, Station Road, West Wickham, Kent. Springpark 3027.

Society of Model and Experimental Engineers Affiliation

A general social meeting of the S.M.E.E. Affiliation has been arranged for Saturday, March 18th, from 2.30 p.m. to 6 p.m., at the Canons Park Community Association, Merrion Avenue, Stanmore (Bakerloo Line). Due to limitations of accommodation, it is impossible to invite all members of all affiliated societies, but it is hoped that every society that can possibly do so, will send three representatives.

The programme will include cine films, and there will be a display of models, tools, drawings and photographs, etc. The Edgware society's workshop will be open for inspection. It is hoped that every society will endeavour to send along at least one model or piece of work, finished or in progress, to add to the general interest.

Representatives will also hear a full report of the final details of the Affiliation's Driver's Certificates Scheme.

It is also hoped to have a selection of the contents of the late Capt. Cerrio's workshop which will be on sale.

This social will afford an opportunity for the constituent societies of establishing direct personal contact amongst themselves.

Lady members or members' wives are included in this invitation, and will be cordially welcomed.

Hon. Secretary : JOHN W. REED, 60, Ennerdale Drive, Kingsbury, London, N.W.9.

Glasgow Society of Model Engineers

The next meeting will be held within the society's rooms at 50, Clarendon Street, Glasgow N.W., on Saturday, March 18th, 1950 at 7.30 p.m.

W. T. Rowell, secretary of the Dundee and District Miniature Race Car Club, has consented to come to Glasgow, and give a talk. This new approach in model development has so far not made the same progress in Scotland, that has been secured for it in England, and members will no doubt welcome an occasion that presents the case.

Visitors will be welcomed and particulars of membership can be had from the Secretary : JOHN W. SMITH, 785, Dumbarton Road, Glasgow, W.1.

Edinburgh Society of Model Engineers

A lantern lecture was recently given by Mr. E. Jones, H.M. Inspector of Factories, on " Safety Measures " before an appreciative audience, numerous questions were asked and ably answered—altogether an instructive evening.

The portable track is making good headway but more workers are requested, any member who wishes to increase his skill with the hacksaw and file will have every opportunity if he contacts Mr. Brown, the Track Convenor.

Through the generosity of the Royal Scottish Museum, about fifty members and friends spent a most enjoyable film evening on Wednesday, February 15th, and we thank the museum authorities for their co-operation in this matter.

Our next meeting is a " Bring and Buy Sale " to be held on Saturday, March 18th, at 3.30 p.m., in the society's club rooms. We are endeavouring to procure as many items as possible, and would all members bring their surplus materials and tools to the club rooms not later than Thursday, March 16th, to enable a catalogue to be prepared. The auctioneer will be our past president, Mr. Davidson.

The clubrooms at Ramsay Lane, Castle Hill, are open on Tuesday and Thursday evenings from 7.30 p.m. and Saturday afternoons from 3.30 p.m., all interested are welcome.

Hon. Secretary : JAMES H. FARR, Wardie Garage, Ferry Road West, Edinburgh, 5. Telephone 84176.

The Bolton and District Society of Model Engineers

The March meeting will be held on Tuesday 14th March, at 7.30 p.m. when Mr. R. C. Crispin will give a lecture on " Craftsmanship in Bygones." This will be an interesting lecture with illustrations and samples of early engineering accomplishments.

The April meeting to be held on Tuesday 11th April, at 7.30 p.m. will be an " Open Meeting " when any member can give a short talk on any subject of interest to model engineers.

The " Club Loco "—an 0-4-0 5 in. gauge tank—being made by the collective efforts of the society members will be shown in the unfinished state at the Northern Association of Model Engineers' Exhibition on March 24th-26th, in Manchester.

The model racing car fans are all " hotting up " their cars in preparation for the opening meeting at Leverhulme Park track on Sunday, 21st May. High speeds are expected at this event.

All model engineers in the district are cordially invited to attend any meeting. These are held monthly in the Co-operative Rooms, Bridge Street, Bolton, Lancs. Any further information will gladly be supplied by the Hon. Secretary : NORMAN BROOKS, 12, Cleveleys Avenue, Bolton, Lancs.